GHT, FEBRUARY 11, 1937 FIRST AERO WEEKLY IN THE WORLD REGD. AT THE G.P.O. AS A NEWSPAPER

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468 XXI

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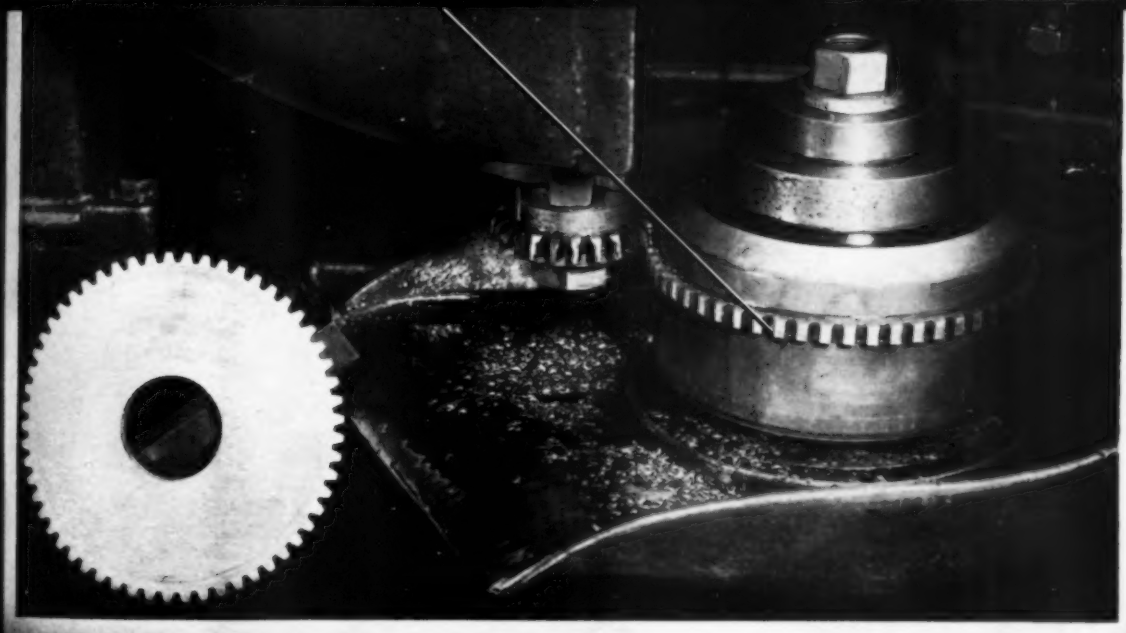

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FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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Extravagant Economy

MILLIONS and tens of millions of pounds has it cost us to re-equip the country for defence in a hurry. Sir Thomas Inskip stressed that point in an address last Saturday, and it is to be hoped that he made the ears of those responsible to tingle. In the lean years two motives seem to have animated our rulers, first, to save money for the moment without thought of the future, and, secondly, to set an example to the world of disarmament, also without due weighing of consequences. Sir Thomas said that he was glad in a way that we had set that example, and perhaps we all share to some extent the glow of conscious virtue which that experiment evoked. Our consciences are clear, at any rate, but an unruly conscience is sometimes a dreadfully expensive possession. Foreign nations declined to be impressed. Some of them have a cynical disbelief in the purity of the British conscience, and they probably concluded that Britain was more intent on saving money than on doing her duty in the world by herself and her friends.

It may be that the cynics were not altogether wrong. We did save money and re-established our financial position, arriving at a position of economic strength which certainly evoked the wondering admiration of the impoverished but heavily armed nations. It may be questioned whether this could not have been achieved without so completely refusing to pay the *premia* on our safety insurance policy. A reasonably steady expenditure on maintaining our defences in a moderate condition of efficiency would, as Sir Thomas pointed out, have been the most economical policy in the long run. We are now in a strong position to foot the bill for rearmament, but the price is much heavier than it need have been.

The worst feature of the past years was the temporary dominance of the extreme, fanatical pacifist party, which buried its head in the sand and declared that even the sight or mention of arms and armed men were accursed things. The pacifists' hatred of war was no greater than that of the nation in general, but their reason was drowned in their sentimentality. They are now a discredited party, and for that all sane men may be thankful. The only pity is that we cannot make them and the other parties who let down our defences pay the greater part of the millions and tens of millions which their folly has cost the nation. The rain, however, falleth upon the just and the unjust.

Economic Range

AS the Short-Mayo Composite aircraft takes shape in the works at Rochester the designers can begin to formulate more definite ideas about actual figures of performance and range than was possible while the design was in its early stages. Short Brothers have always inclined to err on the safe side where performance figures are concerned, and consequently *Flight* was not unduly pessimistic when the first figures leaked out. These showed a cruising speed of approximately 160 m.p.h., or the same as that of the Empire boats, and a range of something over 2,000 miles, with a payload of 1,000 lb. We felt that although the figures were not "spectacular," they would probably be found to be somewhat pessimistic, and that the actual performance figures might turn out rather better.

From information recently released it is evident that this view was justified. The cruising speed originally estimated is still adhered to, as might have been expected from the fact that the *form* of the machine was known from the start, and that it is a twin-float seaplane, the drag of which is naturally greater than that of an aeroplane with retractable undercarriage.

It appears, however, that the structure of the upper component has turned out a good deal stronger than was expected from the original estimate, since it is now announced that the machine is likely to be able to carry not merely the 1,000 lb. payload stipulated, but as much as 4,000 lb. in certain circumstances. It seems likely that this very high figure should be taken to relate

to the flight from America to England, when a following wind is to be expected. The range in still air is estimated to be 3,500 miles, and with full fuel load the machine will cover more than 2,000 miles against a head wind of 60 m.p.h. all the way.

The extra pay load would, presumably, result in an increased gross weight, tolerable because the usual take-off conditions do not apply.

The seaplane was chosen for operational reasons, but if at some future date a landplane should be built as the upper component, it is thought the still-air range would increase to 5,000 miles. That, with a total power of but 1,360 b.h.p., should give really remunerative operation over long ranges.

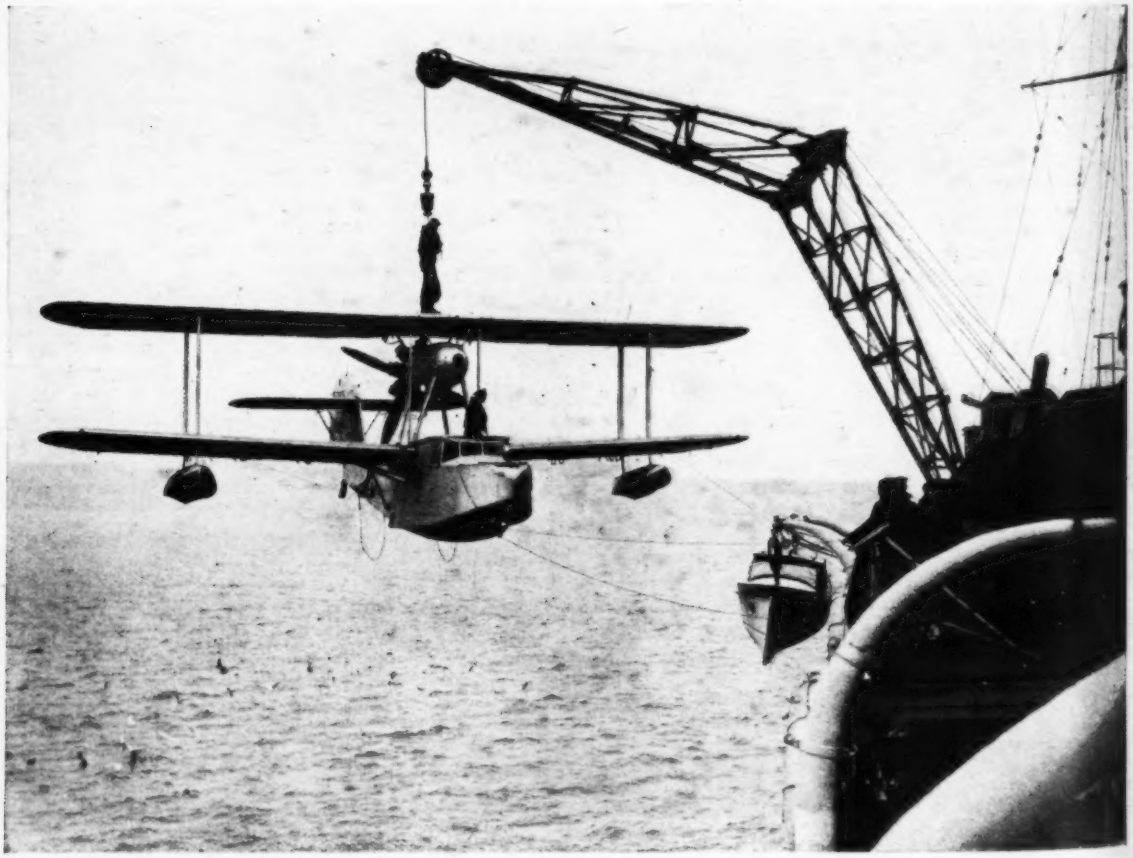
A Three-Year Plan?

THE Cabinet, and presumably the Committee of Imperial Defence, are taking their time in considering the recommendations of Sir Samuel Hoare and Sir Thomas Inskip about the future of the Fleet Air Arm. This is natural, for the controversy has been raging or smouldering for many years, and a hurried decision might seem indecent.

A rumour is now going about that an interim period of three years will be fixed during which the complete control of the Fleet Air Arm will be transferred to the Admiralty. That would give time for the Navy to train the fitters and riggers who will have to take over from the aircraftsmen now responsible for the maintenance of the ship-borne aircraft.

The substitution of Naval personnel for R.A.F. personnel is really the simplest part of the change for which the Admiralty asks. It is such a small matter, concerning merely thirty per cent. of the pilots and a few mechanics per machine, that it seems scarcely worth wrangling over. The loss, if loss it can be called, to the Air Force is slight, while the gain to the Navy in changing over from the vicious system of dual responsibility to the sound method of unified control is very great. Actually, we believe that the Air Ministry would raise no very strong objection to that part of the Admiralty's wishes.

Much more important are the future arrangements for such matters as *ab initio* flying training, aeronautical research, and the placing of orders for aircraft. In all such respects it is very desirable to avoid duplication of effort, overlapping and, above all, competition between the two Departments. We do not want to go back to the bad old days of 1912-1917 when War Office and Admiralty tried to get the better of each other in securing delivery of machines from the aircraft firms. We believe that Navy experts should draw up specifications but that the actual orders ought to be placed by the Air Ministry.



A WALRUS HOOKED: Hoisting a Supermarine Walrus on board *H.M.S. Devonshire* in the Mediterranean. This ubiquitous amphibian—the engine of which is a Bristol Pegasus—can accommodate itself to a catapult, to an aircraft carrier's deck, to the surface of the sea, or to dry land. Incidentally, there is no truth in rumours—which this rather sinister picture might suggest—of new punishments for Fleet Air Arm pilots.

The Outlook

A Running Commentary on Air Topics

Home Defence or Metropolitan?

A CORRESPONDENT has written challenging the statement in our leading article last week to the effect that "by the spring of 1935 the home defence force consisted of 42 squadrons. That is to say, it was 10 squadrons short of the original programme." The programme to which we alluded was that of 1923, when it was laid down that our home defence air force should consist of 52 squadrons. Our correspondent maintains that the latter figure had been attained by May, 1935.

Our figure of 42 squadrons was arrived at in this way: The now defunct Command, Air Defence of Great Britain, comprised 41 squadrons, all fighters or bombers, and to make up the home defence air force the Air Ministry added to that total one squadron of torpedo-bombers stationed at Donibristle and administered by the Coastal Area (as it then was). These 42 squadrons were all available for active defence against raiders or for counter-attack. It was common talk at the time, and was frequently commented upon in many sections of the Press besides *Flight*, that the 1923 programme of having a force of 52 squadrons of fighters and bombers was short by ten squadrons. To make up the total of 52 by adding five army co-operation squadrons and five flying boat squadrons would certainly not be justifiable.

Since the expansion scheme has been undertaken, and the Command, Air Defence of Great Britain, has been broken up into the Bomber Command and the Fighter Command, a new term has come into use, the Metropolitan Air Force. This implies all squadrons stationed in the United Kingdom, exclusive of Fleet Air Arm units temporarily on shore. Army co-operation squadrons, flying boat squadrons, and general reconnaissance squadrons are all included in this term, as well as the fighters, bombers, and torpedo-bombers. It is a way of reckoning which is calculated to confuse the man in the street. If an expeditionary force is sent overseas, the army co-operation squadrons would go with it, and would not be available for home defence. Reconnaissance squadrons and flying boat squadrons may be capable of bombing, but would not be available for the counter-attack without taking them away from their own proper duties. So far as the safety of our cities is concerned, the only matter of interest to the citizen is the strength of the Fighter and Bomber Commands.

A Knot Untied

IT seems clear that the Australian Government has come to realise that sooner or later air-mail surcharges will have to go. Some months ago it was announced that letters would be carried between the capital cities of the States without any surcharge; and, though other internal air mails would have to pay extra postage, this was only a temporary measure, which would be abolished as soon as circumstances permitted.

In agreeing in principle to the Home Government's scheme for a through service by flying boats with Sydney as a terminus, the Commonwealth has, it is reported, declined to yield on the point of surcharge. The charge for sending a letter by air to England used to be 1s. 6d., but it will now be reduced to 6d. or 5d. That is a gain, but the principle of having a surcharge at all is even more important than the amount of the postage to be paid. Letter-writers in England will have no choice as to how their missives shall travel. The Post Office will send them to Australia by air, charging 1½d. per half-ounce. The Australian letter-writer, who may be of Scottish extraction, will have to consider anxiously whether to put on an ordinary stamp and let the letter take over a month to reach his mother in Aberdeen, or whether he will sigh, "Bang goes saxpence," and so ensure its arrival in a trifle over a week. Who can doubt that it will be only a matter of time before the canny instincts and persistence of the public in Australia will demand, and obtain, the same privileges as will be enjoyed by the stay-at-homes in Britain?

Iron Mikes

THAT increasing use is being made of automatic pilots in military aircraft is probably fairly well known. Their application to civil aviation has been rather less rapid, but here also the mechanical pilot is gradually being introduced to relieve the human pilot of some of his work, leaving him free to attend to other and, in some ways, more important duties.

Flight was the first journal to describe in detail the automatic pilot developed by Messrs. Meredith, Cooke and Kerr, of the R.A.E., Farnborough, which is now marketed commercially by Smiths Aircraft Instruments. Mr. G. R. M. Garratt described the two-axes instrument in *The Aircraft Engineer* of July 26 and August 30, 1934, and the aileron control in the issues of March 28 and April 25 of the following year.

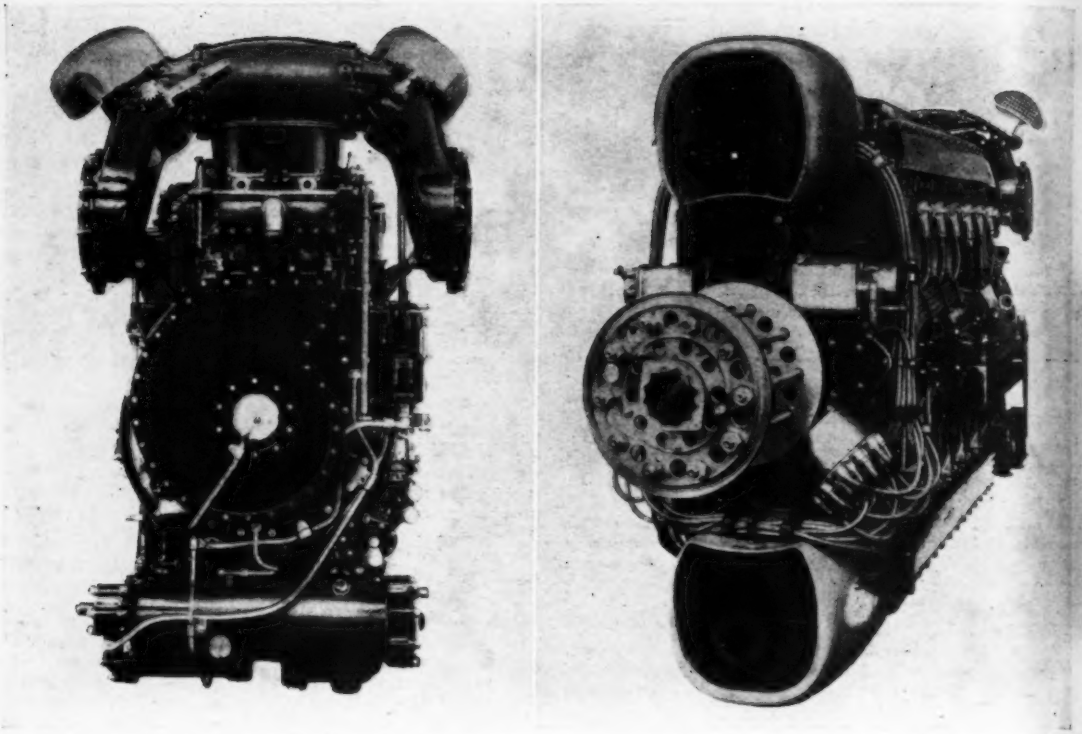
In the paper which two of the designers of the R.A.E. automatic pilot, Mr. F. W. Meredith and Mr. P. A. Cooke, have written for presentation to the Royal Aeronautical Society to-night, a large proportion is devoted to an examination of stability problems, this being deemed necessary in order to get a clear idea of the problem for which a solution is sought. This examination leads the authors to the conclusion that many inventors of alternative methods of stabilisation depending on wind vanes and pendulums are wasting their time because, even if these devices had no "lag," the same results would be obtainable by the aircraft designer by a suitable modification of dihedral angle and of the size or position of the tail organs. The authors claim that all automatic stabilisers of the vane and pendulum type can at best correct errors in aircraft design, and at their worst they may cause a previously well behaved aeroplane to "hunt," or even to get into unstable oscillations.

Branching Out

FOR a great number of years it was left to the late Señor de la Cierva to carry the burden of developing the type of rotating-wing aircraft in which lift was obtained by towing a windmill rotor through the air. There is little doubt that the step-by-step successes of Cierva encouraged others to examine the problem of flight with rotating wings, and in the course of the years different forms of control were developed by different designers. Señor de la Cierva's last great contribution to the problem was the so-called autodynamic rotor head by means of which "jump starts," i.e., starts without any forward run at all, became possible and practical.

To appreciate what the "jump start" may mean in the way of making the whole of Great Britain available, independently of aerodromes, it is only necessary to realise that if no run is required any field large enough to enable the machine to clear the surrounging hedges becomes a potential aerodrome; the nature of the surface matters scarcely at all.

Another serious investigator has now achieved a degree



A DAGGER—AND PART OF ITS SHEATH: Two views of the production version of the 725/805 h.p. Napier Dagger III as mounted in a large batch of Hawker Hector army co-operation biplanes being built by Westland Aircraft. Points to note are the hot and cold air intakes and the forward portion of the cowling with the new "streamlined" entry chutes for the cooling air.

of success with an alternative type which seems to promise well. Some years ago two Austrian engineers, Hafner and Nagler by name, arrived in this country with a somewhat weird helicopter. That machine was used at Heston for practical research on the blade-incidence control, and was not, as most people imagined, intended as a type in itself. Much was learned from it, and the results were incorporated in a different machine in which the rotor was of the windmill type, and an orthodox airscrew was used for propulsion. Short flights were made with this machine in 1935, and with a modified version in 1936.

Judging from a demonstration witnessed by members of *Flight's* staff at Hanworth last Saturday, the Hafner A.R.III has now reached a stage in its development when it promises to take its place among practical gyroplanes. It does not jump straight into the air, but its take-off run is almost ridiculously short, and the angle of climb can only be described as impressive. On Saturday the pilot was doing nearly vertically banked turns close to the ground, and threw the machine about as if it were a small fixed-wing aeroplane. The secret seems to lie in the type of incidence control used, which does away with any tilting of the rotor head.

Photographs appear on the opposite page.

Forthcoming Events

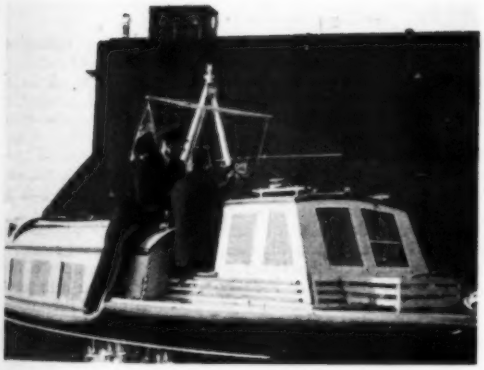
February 11. R.Ae.S. Lecture*: "The Automatic Pilot," by Mr. F. W. Meredith and Mr. P. A. Cooke.
February 12. De Havilland Technical School Annual Dance, 9 p.m., Hyde Park Hotel, London, W.1.
February 16. R.Ae.S. (Students'-Section) Lecture*: "Production of Light Metal-clad Aircraft," by Mr. I. Waddington.
February 17. Royal United Services Institution Lecture: "Air Force Co-operation in Policing the Empire," by Air Comdr. C. F. A. Portal.
February 18. R.Ae.S. Lecture*: "Possible Layouts for Air-cooled Engines," by Mr. A. H. R. Fedden.
February 18. Civil Aviation Service Corps: Dance, First Avenue Hotel, London.
February 18. Norfolk and Norwich Aero Club: Tenth Anniversary Dinner.
February 18. R.Ae.S. (Coventry Branch) Lecture: "Silencing Aircraft," by A. H. Davis. Armstrong Canteen 8.15 p.m.
February 19. Croydon Airport Annual Dinner and Dance.
February 20. Rugby: R.A.F. v. Royal Navy, Twickenham.
February 22-26. Egyptian R.Ae.C.: Oasis Meeting.
February 25. R.Ae.S. Lecture*: "Power Measurements in the Air," by Mr. N. S. Muir.
February 26. Brooklands and Associated Clubs: Dinner and Dance, May Fair Hotel, London.
February 26. Hampshire Aeroplane Club: Annual Dinner and Dance, South-Western Hotel, Southampton.
March 11. R.Ae.S. Lecture*: "Airscrew Blade Vibration," by Major B. C. Carter.
March 12. Leicestershire Aero Club: Annual Ball, Grand Hotel, Leicester.
March 12. Cinque Ports Flying Club: Annual Dinner and Dance, Grand Hotel, Folkestone.
March 18. R.Ae.S. (Coventry Branch) Lecture: "Navigation," by Sqn.-Ldr. Godsave. Armstrong Siddeley Canteen, 8.15 p.m.
April 3. Rugby; R.A.F. v. Army, Twickenham.
April 8. R.Ae.S. Lecture*: "Control Problems," by Mr. A. G. Pugsley.
April 15. R.Ae.S. (Coventry Branch) Lecture: "Production and Inspection Methods Applied to Screw Threads," by S. J. Harley. Armstrong Siddeley Canteen, 8.15 p.m.
April 22. R.Ae.S. Lecture*: "Power Plant Trends," by Mr. G. J. Mead.
May 26—June 6. Brussels Aero Show.
May 27. R.Ae.S. Wilbur Wright Lecture: "Turbulence," by Dr. Theodor von Karman. Science Museum, South Kensington.
May 21 and May 29. London-Isle of Man Race and Round-the-Island Contests.
May 29. Empire Air Day.
July 23—August 27. Swiss International Meeting.
July 31. Cinque Ports Flying Club: Folkestone Aero Trophy Race.
August 28 and 29. Cinque Ports Flying Club: Lympne International Rally and Wakefield Trophy Race.

* These lectures take place at the Royal Society of Arts, 18, John St., London, W.C.2, at 6.30 p.m. Admission is by ticket obtainable through a member.

NEWS of the WEEK in PICTURES

(*Flight* photographs)

After many years of development work the Hafner "direct flight" gyroplane is now going through its final flight tests—and coming well up to expectations. On the right, above, the machine is shown taking off from the centre of the compass base at Hanworth after a run of a yard or so in an 8-10 m.p.h. wind. The picture on the left gives an idea of the compactness of the special rotor head, while in the centre is the designer himself. Editorial comment on this remarkable machine appears on the opposite page.



Snapped alongside the famous floating dock at Southampton—an Imperial Airways officer using the Marconi medium and short-wave shore communication set with which the Power Boats in attendance on the Empire flying boats are equipped.

An Avro 626 (275 h.p. Armstrong Siddeley Cheetah V) trainer for Brazil. It can be used for a variety of purposes, the rear cockpit being adaptable for gunnery, prone bombing, photography or radio, while provision is made for instrument flying and message collection. In the front seat is Mr. H. A. Brown (Avro chief test pilot), and the passenger is Señor Polzin, Brazilian Vice-Consul.

Correspondence

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for publication in these columns.

REDUCING RADIO CONGESTION

I HAVE read with interest in the February 4 issue of *Flight* (p. 130) the criticisms and proposals of one who, under the non-de-plume of "Critic," questions the ability of the present class of air wireless operators.

In some respects "Critic" appears to have inadequate knowledge of the points on which he expresses opinion.

Apropos of his desire to see the standard of air operating raised to that of marine operating, necessitating greater morse speed tests and extensive D/F. experience, does he realise that one of the premier British air lines has, for some time past, recruited ex-marine operators with sea service ranging from three to fifteen years and possessing 1st Class P.M.G. Certificates, which qualification covers complete theoretical and practical knowledge of D/F., and high-speed morse working of not less than twenty-five words per minute?

While fully agreeing with "Critic" in his suggestion that more extensive use of D/F. apparatus on machines would enable a large proportion of the present congestion of the æther to be eliminated, I feel sure he is greatly mistaken in attributing the lack of apparatus to the inability of operators to handle it.

With regard to the suggested inauguration of a public radio-telegram service from aircraft, this is a matter requiring more careful consideration than that which "Critic" appears to give it. Theoretically, it would seem simple, but when one realises the amount of responsibility of an operator on busy routes, especially in conditions of bad visibility, when his chief task is one of maintaining constant watch for machines in the same vicinity to avoid risk of collision, the idea in practice is subject to much complication. It would be a dangerous possibility for the operator of an air liner to miss important information relating to navigation (such as the changing of height of other machines on the same route, etc.) through being engaged with radio-telegram traffic on another waveband, thus prejudicing the safety of air navigation, which, after all, is the primary purpose of aircraft wireless. It would appear, therefore, that the only really practical method of introducing such a service on busy routes without detracting from the efficiency of wireless as an aid to navigation would be to carry more than one operator, so that the most important wave watch would not be broken at any time.

"Critic's" description of the present standard of payment of air operators is very apt, and any increase on the present duties of operators should certainly be met with an increase of salary.

AEROP.

Croydon.

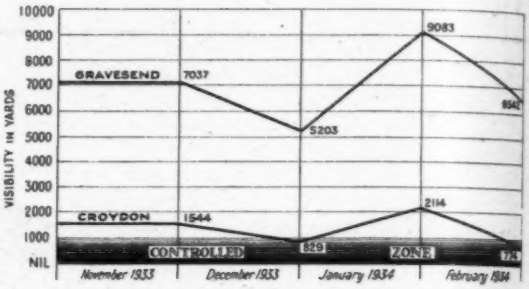
CROYDON, GATWICK AND GRAVESEND

IN your issue of January 7 there appeared a letter from Mr. Donald G. Southwell, entitled "Croydon, Gatwick and Gravesend," in which Mr. Southwell remarked that "it would be interesting to keep an official set of figures of Gravesend visibility for a month together with those of Croydon and have them compared."

It may be of general interest that, prior to this Company acquiring control of Gravesend Airport, official figures were kept at Croydon and Gravesend over a period of four months—from November, 1933, to February, 1934—and these records, if I remember rightly, were taken three times daily over this period.

Owing to the large amount of figures which these records contained, we compiled a chart from them showing the average visibility over this period, and we enclose a copy which you may find interesting enough to publish.

I also note that Mr. Southwell considers that Airports, Ltd., are too conservative in their use of electricity for beacons, etc. In this respect I would point out that if any pilot wishes any of the lights to be switched on he has only to ask, but most people do not seem to appreciate that to switch on obstruction lights, beacons, etc., every night for a number of hours is a comparatively expensive item in the accounts of an airport, and, where an airport is not owned by a Government or municipal authority, it cannot afford to disregard an expense that can be avoided—especially as it serves no useful purpose except to act as a guidance for pilots on a regular service who do not wish to use the airport but may nevertheless be glad to see its lights.



Croydon and Gravesend visibility compared—the chart referred to by Mr. A. M. Desoutter.

The difficulty is that the companies operating these airline services will not make any contribution towards the cost of the lighting which their pilots find so useful on days of bad visibility.

AIRPORTS, LTD.

Gatwick Airport. A. M. DESOUTTER, Managing Director.

THOSE TAPERED WINGS

IN mooting the topical subject of tapered-wing stalling in your columns, I fear I have trespassed on hallowed soil: the sacred ground of the "rationalist," who views all design and research problems as a neatly arranged pattern of scientific deduction and crystal-clear solution. In turning the other cheek for Dr. Lachmann's attention, perhaps I should remind him that all the most inspired designs are created on the back of an envelope pulled from the designer's pocket in a moment of inspiration; or maybe a fit of desperation after looking at the other fellow's bad dreams!

However, at the risk of tiresome reiteration—since he accuses me of unanswering his demand for "rational reasons"—I must refer him to the third and fourth paragraphs of my original letter of December 10, also the fourth and fifth paragraphs of my letter of December 31. If he will take the trouble to re-read them, dispassionately, he will see that I suggested *beginning* with the elliptical plan form simply because it is the basic shape postulated in the vortex theory, hence its value as an aerodynamic standard or yardstick. Perhaps Dr. Lachmann will suggest a more "rational" standard for a family of related aerofoil tests.

From the contents of his third paragraph, one is now told that he is *not* against my suggestion for elliptical wing research, although earlier this was rudely chastised as a "fetish." One also gets the impression that Dr. Lachmann now wishes to disclaim the advocacy of highly tapered trapezoidal wings, which is a curious *volte-face* in view of his public statements and the physical evidence provided by the products of his own firm. Yet for some irrational reason I am singled out for his displeasure because I had the temerity to question these excessive taper ratios of 4 and 5 to 1.

Apparently, Dr. Lachmann objects to my vivisection of his "careful analysis" of profile drags as derived from Göttingen low-scale tests. (Parenthetically, I am astonished to learn that I have insulted Göttingen's high altars because I queried the use of 1925 aerofoil data by a designer in 1936; my criticism was obviously directed to the latter). But the careful analysis is now seen to consist, as I suspected, of an induced drag term containing an induction correction factor (Glauert's "delta" term) for plan form and span loading—which is the nigger in the woodpile, since the correction factor itself is under dispute, as I have already shown. Compare, for example, Dr. Lachmann's own assumptions for induced drag derived from Glauert, with those given by Higgins in N.A.C.A. Technical Report No. 312, wherein the results have been properly corrected for lift curve slope. Betz in "Aerodynamic Theory" (Vol. IV) gives yet another set of correction factors

for a rectangular wing, so when theorist confounds theorist who is right? While it is perfectly true that these differences are second order quantities, nevertheless, they tend to mask the residual profile drag, introducing uncertainties from which the elliptical wing is, according to theory, entirely free. On theoretical grounds, then, the elliptical wing is the most reliable standard for assessing profile drag from the usual tunnel test.

The readers who are following this discussion will be amused to learn that the elliptical wing, which was first characterised as a "fetish," is now just a "fad" because a number of leading designers are building them—without benefit of slots, one might add. This line of argument is so flimsy as to be untenable, since it would be equally true of slotted wings and many other forms of engineering endeavour. Moreover, Dr. Lachmann is particularly unfortunate in citing the large wing fillet as a case in point. It may not be worthwhile on the Lockheed wing-body junction, but it was admirable for the Northrop ensemble, as I happen to know from "on-the-spot" information. So, too, with the elliptical wing on an aeroplane, it is but part of the composite picture; sling a Doge's Palace on to it and it will assuredly ruin that picture. One can well imagine that any form of tapered wing in the hands of an uninspired designer would emerge as a succession of lost chords.

In cheerfully repudiating the harsh epithets of which Dr. Lachmann accuses me, I fear he has exaggerated a little gentle leg-pulling from this quarter. This is all the more surprising in that he gave the initial tweak in the concluding paragraph of his letter of December 17, so he has little cause for genuine complaint. But perhaps a little touch of acidulated aeronautics may help to ventilate some of the fascinating problems connected with tapered wings, whether elliptical or trapezoidal.

I should like to assure Dr. Lachmann that while I disagree entirely with his conception of tapered plan forms, in the light of present knowledge, I do not deny him the right to express a personal viewpoint; neither do I withhold my respect for his sincerity in propagating such views. On his side I suggest that he might accord an opponent the same honours.

Heston STANLEY H. EVANS

MASS CONSUMPTION

DO we want the £100 aeroplane? God forbid! One has only to look at the roads for an example of how the £100 car is a very mixed blessing. A mass-produced aeroplane at about this figure would be a curse. This is not pure snobbishness—far from it, merely an appeal on the part of one perhaps more impecunious than most, but who has had some limited experience of flying and driving. Perhaps I had better qualify this before I am shot down! The speedometers of the various cars I have owned during the last eight years give me a total mileage of well over 200,000. My log-books give me a total of some 500 hours' flying on 25 types varying from four-engined flying boats down to light aircraft. Now have I your permission to proceed with my reasons for this sweeping statement?

The man who can afford to lay down upwards of £500 for a car or aircraft is usually one with a certain amount of leisure and one to whom the spending of an extra (say) £50 on tuition presents no serious obstacle. He, therefore, becomes fairly well trained because he can give his time and money to it. The man who just scrapes together £100 for his means of transport has also to go very carefully with his tuition expenses. The usual result of this is that he goes solo as a by no means safe driver or pilot, and though we are not unduly worried about his own neck, he is a positive menace to others. It is not so much a question of training but of experience, and this can only be gained at the expense of time. Personally, I have reached the stage when I realise how much there is to be learnt about both driving or flying and every time I travel there is something new to learn.

The optimist who tells me with pride that he went solo after five hours or was allowed to drive after a couple gets my advice to go back and have twice as much instruction. He may be able to perform the mechanical operations of the controls in an exemplary manner but he cannot be safe. He has not had the experience to know what to do if an emergency arose. Nor has he had time to learn sufficiently well so that his hands are co-ordinated with the brain instinctively, so that he does the right thing without thinking. In the air the fraction of a second needed to consider the forthcoming manœuvre may mean a crash.

But to return to the example of the cheap car. The man who buys a £100 car (usually on the H.P. system) and drives it only at week-ends is undoubtedly a menace to others on the road. One has only to look at them on a summer Sunday afternoon. They drive in the middle of the roads at inconveniently low speeds seemingly having no idea that others may have appointments to keep, or a journey to do, and want to pass and travel a little faster. They yaw to the right before taking left-hand turns. One sees agitated hands, flapping out of the windows of small saloons, making gross misrepresentations and misuse of the signals given in the highway code. They pass just before blind corners and as often as not take the latter on the wrong side. One can only put it down to absolute lack of imagination coupled with chronic absence of experience. What is going to happen when this type of driver gets into his £100 aircraft? Perhaps the slow driver (which usually means the slow thinker) never gets into an accident which involves more than the bending of a mud-wing, and he, therefore, considers himself a first-class safe driver. In the air the scraping of a wing may be just as fatal as a head-on collision, and one cannot throttle back and consider oneself immune because of the slow rate of progress. (Even if an autogiro will do 20 m.p.h. there is still the fact that a rotor impinging on another object in the air would have disastrous consequences.)

So please save us from the cheap aircraft and the half-trained pilot. Some people have to earn their daily bread in the air; let us not make it any more dangerous than it already is. HEADLIGHT.

Kent.

ANOTHER VIEW

READING Mr. Hammond's opinion (January 14) on the market for a cheap aeroplane, one gathers that there is no hope whatever for the aircraft industry, apart from military production, because nobody will be interested in flying when suitable machines are produced.

To say that Mrs. Brown and Mrs. Jones will never be interested because they cannot go shopping in one seems as good as suggesting that Mrs. Brown cannot be interested in horse-riding for the same reason. I should think that a census of the number of horses and riders in the country would give a rough idea of the potential flying market, given certain conditions I hope to mention.

Referring back to the two ladies, I should imagine that if Mr. Jones took his wife for an occasional week-end flying trip Mrs. Brown would soon see that Mr. Brown did the same—it's only a matter of fashion, and money, for most business thrives on the fact that most people are as good and as clever as their neighbours, and they are also afraid of missing something they could afford.

Before this sort of thing takes place, it's absolutely necessary to have aerodromes at every town, and that is why we in England are being left hopelessly behind by America. Without roads there would be no car industry, and without numerous aerodromes there can be no aircraft industry as far as private people are concerned. Because of this difference the American can buy a good four-cylinder, well made, 40 h.p. two-seater aeroplane at £250 new, or a 70 h.p. seven-cylinder radial at £420 with brakes and all the rest. They are cheap because over there they have the airports and there is a market. They seem to have reached the stage between individual production and mass production, and by the time we have progressed so far they will be mass-producing.

I don't think it takes a particularly long-sighted person to realise we have lost the export market already, for while the trade has been croaking that there is no home market—a fact which is unfortunately true—it might offer something more than ten-year-old American designs with two-cylinder engines and wings strung up with wires.

If British designers and manufacturers are unwilling to take the market seriously—and I don't blame them—why can't we have the duty removed and so encourage the growth of large clubs, leading to the aerodrome growth necessary before quantity production can take root over here?

There seems no doubt that the trade has kept up prices owing to the limited consumption and has naturally catered for the people with money. Let them go on doing so, but let us also have access to the cheaper American product on which to form the basis of a larger consumption, and also let us have aerodromes quickly. P. PRIEST.

Huddersfield.

Readers will greatly assist us—and increase their own chances of appearing in print—by keeping letters as brief as possible. This week's contributions should *not* be taken as a good example.

COMMERCIAL AVIATION

— AIRLINES — AIRPORTS —

THE WEEK AT CROYDON

White Line Change : Distinguished Visitors : Another Alternative : Mutual Assistance

NOW that the Lorenz equipment is in working order at Croydon a slight change is being made in the direction of the white line to bring it into the exact short-wave approach track without affecting its usefulness for blind take-offs. Working from the west end of the white line, short strips are being placed to cross it at points a quarter, half and three-quarters of its length; these "bars" should also prove useful during a take-off.

Eventually, it is rumoured, this line may be entirely of lights sunk into the ground under very thick glass, on the same principle as that adopted for the existing neon strip. The line may even be tricolour—say, red, green and amber—so that a change of light gives the pilot his whereabouts along it. The difficulty at present is to know which colours show up best in fog, and many pilots prefer the idea of amber, both white and red tending to become merely a confused blur. Another idea which has been mentioned is that of having a line of lights on each side of the main line, on one side "dots" and on the other side "dashes," corresponding to the radio signals normally received.

Land Ho!

At the end of last week Croydon received distinguished visitors in the presence of the British Airways operating staff from Gatwick, where, somebody said, it was dampish. The dove from the Gatwick "ark" who "found a place for the sole of his foot" (and that, moreover, without a protective golosh) was Mr. van Oppen, who probably reported that, though the company at Croydon was low, the surface was high—and dry. He was protected by an enormous and, presumably, amphibious dog, but it is not true that he brought a pet eel with him. That was one of those shiny leather dog whip-cum-lead affairs. Mr. van Oppen is well known at Croydon, for he was at one time flying from here for Spartan Air Lines. Another British Airways visitor to be "welcomed home" was Mr. Higgins, for many years a member of Imperial Airways' operational department, and Mr. Whitehead, who also used to be with Spartans. Numerous other B.A. people came in, and it was interesting to see that the B.C.A. people were the ones to welcome them and show them round. The amalgamation between these two companies is now more or less an accomplished fact.

Apart from the rain, which is now regarded as normal, we had some pretty difficult flying weather last week. On Friday several early newspaper machines and an Imperial machine from Cologne had to put in at Southampton.

Southampton seems to find some favour in these days as an airport of refuge in bad weather, and I am told that Swissair sent a Douglas D.C.2 (pilot, Capt. Heitmanek) down there to have a look. He was impressed with the size of the place and with most of its facilities. Some improvement in radio service is possible, according to report. On Friday, by the way, the outward K.L.M. 10 a.m. service from Croydon had to put back for engine trouble, an unusual occurrence in these days. It would not have mattered if the weather had been good, but there were anxious moments before the pilot landed safely at Eastchurch. Croydon, Gravesend, Lympne and most other places were practically impossible, and Eastchurch was by no means good. I am told the R.A.F. people there gave K.L.M. the most admirable assistance, entertained passengers in the Mess, and acted like fairy godfathers to the mechanics who went down to help. An engine had to be changed, and it is interesting that one was shipped from Holland by boat and arrived there on Saturday morning and was installed by the evening. As I have remarked previously, if international affairs, which these politicians seem to find so difficult and which they tie up into such knots, could only be left to a few intelligent aviation people of all nations we should have a much more comfortable world in which to live.

By the way, apologies to Mr. John Kenworthy, of Rollasons, for having inadvertently implied (in the issue of January 21) that Farnborough's efficiency ceased when he went there. As I cannot blame the printer, I'll push it on to the sub-editor, who by now ought to know something of my occasional lapses in this direction.

From February 1 a same-day connection between London and Warsaw has been available via Posen, the companies concerned being K.L.M., D.L.H., and L.O.T. (Polish Air Lines), and the machines used being, on various sections, Douglas D.C.2s, Junkers Ju.86s, and Heinkels. Even in winter you can breakfast in England and take tea in Warsaw.

Out of that an interesting fact arises, given me in conversation recently with a big railway man interested in cross-Channel boat services. He said that there was a time when he looked on air services with scorn and amusement, and another period when he viewed them with alarm because they looked like taking all his first-class passengers. Today he rather liked them than otherwise because his own cross-Channel passengers had steadily increased, and he rather thought that air travel had taught people, in this country anyway, that Continental travel was easier and less adventurous than rush-hour travel to and from London's suburbs.

A. VIATOR.

["A. VIATOR" asks us to explain that his comments last week on the Dragonfly expedition were, as readers no doubt appreciated, made in good humour. No one could foresee that the trip would end thus tragically, and *Flight* had gone to press before news came through that anything was amiss.—ED.]

More Life-saving

THE Campbeltown lifeboat has recently had her radio set modified so that the crew may receive messages from the Northern and Scottish fleet which plies in that and other areas. This is a very sensible move and is particularly interesting news following the paragraph on p. 130 of last week's issue.

Northern and Scottish have been operating an air ambulance for some time and have been co-operating with the Argyll and Inverness authorities in bringing urgent cases from the islands and Highlands. The Campbeltown Co-operative Society has recently started a special scheme whereby this facility will be available to members in return for a small subscription.

Surveying the Islands

THE first part of a survey of flying-boat bases between the Clyde and the Hebrides has now been made. Capt. Glyn Roberts, director of West of Scotland Air Services, has completed negotiations at Greenock, where a site has been selected in the Great Harbour. Sheds will be built, the existing slipways will be enlarged, and a giant crane erected.

This week Capt. Glyn Roberts expects to survey a stretch of water at Mull, and thus to complete plans to establish a chain of safe harbourages at Greenock, Mull, Skye and Stornoway. A large floating raft will be anchored in Stornoway harbour.

A START POSTPONED

"Castor" Leaves for the East—but Not for Long

SHORT BROTHERS have now delivered seven of the "C" class flying boats to Imperial Airways, four of them for Empire services, namely, *Canopus, Centaurus, Castor,* and *Cassiopeia*; two for long-range experiments, *Caledonia* and *Cambria*; and *Cavalier* for the Bermuda-New York service.

All except the last-named have been used for experimental flights between the temporary base at Hythe, Southampton, and Alexandria, and sufficient experience has now been amassed to permit of starting a regular twice-a-week service on that route, cutting out the irritating train journey between Paris and Brindisi, at least so far as the outward services to India and Australia and the two inward services from Central and South Africa are concerned. On one of the experimental flights, that by *Cassiopeia*, which started on January 26, thirteen passengers were carried. The time has now arrived for carrying passengers on the regular scheduled services. At present the flying boats only go to Alexandria, and there the passengers tranship to landplanes. When more boats are available they will fly right through to Sydney and Durban.

Last Saturday, February 6, was fixed for the initial regular flight, and *Castor* was the boat chosen to inaugurate it. Henceforth, Wednesdays and Saturdays are the days for leaving for the East. Eight passengers had booked seats from Hythe, one more was due to be picked up at Marseilles, and another at Brindisi. Over a ton of mail and freight was also booked, some of it consisting of bullion. At 8.30 a.m. the *Imperial Airways Special* steamed out of Waterloo with the eight passengers on board, as well as the representatives of *Flight*.

At Southampton the party, after admiring the sight of the *Queen Mary* and the *Aquitania* side by side in one of the docks, embarked on the Imperial Airways launches supplied by the British Power Boat Company, the passengers and baggage going by fast Power Boats. Hythe pier is one of the longest in the kingdom, being carried out over the mud flats to deep water. However, the tide was high when the party arrived, and (marvellous to relate!) the sun was shining cheerfully, shining with all his might. He did his very best to make the billows smooth and bright, and this was odd—though for a different reason than that given by Lewis Carroll. Some distance from the end of the pier *Castor* rode at moorings, and not far off *Caledonia* was also moored. *Cambria* was in one of the sheds on the shore. In the sunshine the scene was quite attractive, but it was obvious that there are grave inconveniences about a temporary base. Passengers prefer to board their craft from the pier, not to be taken out to it by launch; and when the surface is at all rough it is a delicate job to lay a launch alongside a flying boat without damaging the hull of the aircraft. A step from one unsteady platform to one rather less unsteady, with water between them, is really unpopular with the less agile class of passenger. Moreover, Southampton Water is full of flotsam, and those who followed the Schneider contests remember how Dal Molin once punctured a float and nearly lost the Macchi in which he gained second place in the race of 1929.

False Start

On Saturday there were actually no billows, and the eight passengers and the cargo were all taken on board without discomfort. At 11.45 a.m. Captain H. W. C. Alger started up his four Pegasus engines—which had evidently been thoroughly warmed-up beforehand—and almost immediately he slipped his moorings and taxied round into the wind. With an incredibly short run *Castor* took off and slowly climbed. Alger did not at once head out on his course, but circled round overhead for ten minutes. Then, exactly at noon, he landed again, taxied up to his moorings, and made fast. The report was that two plugs had oiled up on one of the outboard engines. Mechanics at once got busy removing the cowling, but time passed, and presently it was too late to make Brindisi that night. So the passengers were brought ashore and put up at a hotel in Hythe. The intention was to start early next morning, but on Sunday the weather broke, and *Castor* did not start until Monday. On that day bad weather in the Rhone valley caused a deviation and a further delay.

It was unfortunate that what ought to have been an important milestone in the progress of British air transport should thus have fallen flat, but little setbacks never hold Imperial Airways up for long. Once the Air Minister, then Sir Samuel Hoare, flew off to India to inaugurate the air service to that country, but a long time had to pass before that service became regular. To-day it is none the worse for the false start, and so, we feel sure, will it be with the all-air service to Alexandria, which ought to have begun regular operation last Saturday.

First Class

TWO candidates, Messrs. J. C. K. Rogers and W. J. D'A. Stacey, passed the January examination for First Class Navigators' Licences. Seven candidates sat. The next examination will be held in April.

Complete Fusion

AT long last the negotiations relating to the amalgamation between British Airways and British Continental Airways have been completed, and the agreement has been signed. For six months the former company has been operating B.C.A.'s original services, and the latter's fleet has been used by them.

S.43s for China

TWO Cyclone-engined Sikorsky S.43 amphibians have recently been delivered to the China National Aviation Corporation—a subsidiary of Pan-American Airways. Such a type should be extremely useful in a vast country like China, where aerodromes are few and where stretches of water, natural or accidental, are many. It will be remembered that this company, until comparatively recently, used Loening amphibians.

More "Feeder-Liners" for Air France

SINCE last summer Air France have been making use of small six-seater machines for feeder services and charter work. When, last July, six Potex 56s were ordered, it was regarded as a new departure in policy. The experiment has proved beneficial, for a further order for small machines has just been placed, this time for twin-engined Caudron Goelands.

The decision to place this order was made after the first of a series of three Goelands, ordered by the Bulgarian Government, had passed its C. of A. tests with an all-up weight of 8,140 lb., which included a crew of two, 1,300 lb. of pay load, and fuel for a non-stop flight of 1,500 miles. The cruising speed was 180 m.p.h., at three-quarters of the nominal power. With one engine stopped the machine was able to maintain height at 7,500ft.

The Newton Stewart Accident

AFTER a search lasting two days, the missing Dragonfly, which was being used for an unofficial survey of the Maybury Report's recommended routes, was found on Darnaw Hill, Kirkcudbright, sixteen miles from Newton Stewart, on February 4. All four occupants lost their lives.

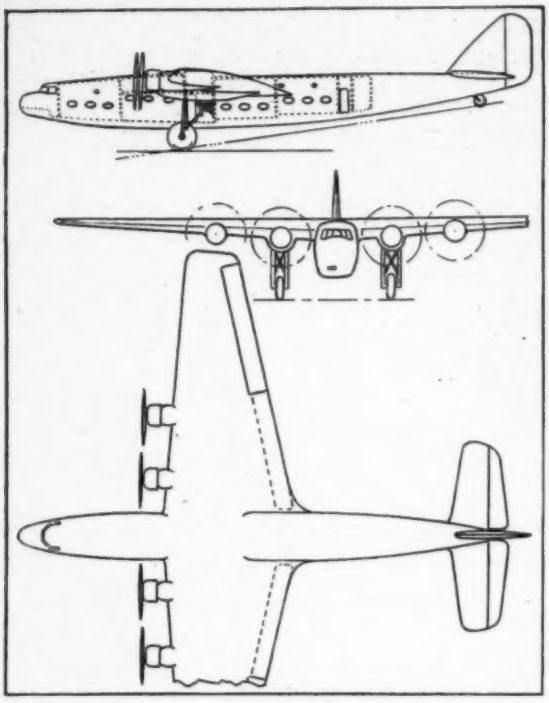
Major H. C. Pemberton, D.S.O., was the son of Sir Max Pemberton, and had had a distinguished military and journalistic career. With the *Daily Mail* under the late Lord Northcliffe before the war, he later set a fashion in specialised journalism and acted as motoring correspondent for this paper until 1929. He then joined the staff of the *Daily Express* and acted as correspondent in both Abyssinia and Spain.

The pilot of the machine, Mr. L. T. Jackson, served in the R.A.F. and was with Air Dispatch before joining Personal Airways, from whom the *Daily Express* had chartered the ill-fated machine. Mr. R. C. Wesley was a photographer on the staff of the newspaper, and Mr. T. H. Philpott had also had much experience with Air Dispatch as radio operator before joining Personal Airways.

A memorial service, held at St. Bride's Church, Fleet Street, last Tuesday, February 9, was attended by a large number of people, prominent in the aircraft and automobile worlds, who paid their last tribute to the four victims.

For the moment the cause of the tragedy remains unknown, but there is little doubt that the machine's radio equipment failed and it is possible that Mr. Jackson imagined that he was flying over the sea when he started to lose height through the clouds. The machine had left Renfrew on a flight to Speke, Liverpool, and the accident occurred some forty miles to the west of the direct route between these points.

Commercial Aviation



These general arrangement drawings of the *Ensign* class monoplanes being built for Imperial Airways by Armstrong Whitworths bring out some striking design features. The span is 123 ft., length 110 ft., and wing area 2,450 sq. ft.

Radio Testing Apparatus

IN addition to their detailed descriptive leaflets appertaining to each class of equipment, Marconi-Ekco Instruments, Ltd., Electra House, Victoria Embankment, London, W.C.2, have issued a leaflet dealing pictorially with two dozen outstanding items from their range of radio and electrical-testing apparatus.

The New Technique

THE manufacture of "bits" for the aircraft industry is not naturally considered as a very interesting business, and the firm which orders and duly receives them does not usually find it necessary to drop a line of congratulation to the manufacturer. That it can be both interesting and praiseworthy may be gathered from a visit to the shops of Rollason Aircraft Services at Croydon.

Not only are their "bits"—whether simple pressings and jigs, or larger parts requiring the most accurate shaping and the most difficult riveting—works of art in themselves, but the methods developed for their quantity manufacture, without big losses on rejects, show a pleasing ingenuity on the part, mainly, of Mr. F. C. Lane, who is in charge of that section of the shops. The fact that Mr. Lane was, until two years ago, an instructor at the Aeronautical College gives the visitor a clue to explain how unskilled as well as skilled people can produce work of such a high standard. If any difficulty is experienced he can attempt to do the job himself and thereby discover where this difficulty lies.

During the past six months or more a great deal of special machinery has been installed in Rollason's hangar for this specialised sub-contract work, including two interesting universal milling machines, but the normal maintenance and overhaul work goes on as before.

Let us hope that, when this rapid Air Force expansion is no longer necessary, the new machinery bought and the new experience gained at Rollasons, and in all other shops, will be equally useful in the manufacture and maintenance of really magnificent all-metal civil types for the world's airways. There should, in any case, never be any question of a "slump" in aircraft manufacture now that there is both the machinery and the experience.

Lightening the Darkness

THE General Electric Co., Ltd., report the closing of an Air Ministry contract for a large quantity of Osram aerodrome floodlighting lamps.

Anglo-German Tests

VARIOUS types of night landings were practised at Heston last week by one of the Junkers Ju.52 machines recently acquired by British Airways for their night mail services. The pilot was Flt. Lt. John Pugh. Three take-offs and landings were made with the airport floodlighting, and three with the aeroplane's own retractable landing light in the port wing. A further two landings were made with the wing-tip flares housed in the starboard wing. The first Ju.52 for British Airways was illustrated in *Flight* of January 21.

Trans-Oceanic History

Tod und Sieg uber den Weltmeeren, by Joachim and Heinz Matthias (E. S. Mittler and Son, Berlin.)

NOW that four countries are interesting themselves very seriously in trans-Atlantic and trans-Pacific mail and passenger services, it is surely time that the whole history of transoceanic flying should be reviewed. Unfortunately it has been left to German joint authors and a German publisher to produce a book covering the subject in detailed yet semi-popular manner.

This history goes back to Blériot's Channel crossing and deals with the work of D.L.H., the Zeppelin operating company, Air France and Pan-American Airways, as well as describing the various stunt or semi-stunt crossings. Those who can read German script with facility will find a great deal of interesting information in this volume—and the others will enjoy the pictorial history. One is made to feel a little more internationally minded both by the book itself and by the publishers précis (known here and in America as "blurb") inside the jacket. It would seem that blurb is blurb in all countries!

Our Chance

ALTHOUGH there is still no direct air mail communications between this country and Argentina, the use of the otherwise provided air mail facilities shows a steady increase. Within four years the amount of air mail carried has been more than trebled, as shown by the following figures covering the years from 1933 up to and including 1936. These figures given are official:

AIR MAIL FROM THE U.K. TO ARGENTINE

Year.	Total carried. lb.	Routes used. *Via* France. lb.	*Via* Germany. lb.
1933	1670	1560	110
1934	2340	1680	660
1935	3410	1980	1430
1936	4970	2890	2080

Two services are, of course, available for the South American air mail. One is operated weekly by Air France and reaches the Argentine capital on the fourth day after departure from Paris. A connecting service from London leaves Croydon early on Saturday afternoon. The other weekly service is operated by D.L.H. between Frankfort-on-Main and Natal (Brazil), whence the air mail is taken further south by Syndicato Condor, the Brazilian Branch of D.L.H. In this case the connecting service leaves Croydon every Wednesday night.

Both the French and the German lines ensure a great advantage for the British business world, as they mean a gain of from 12 to 19 days over the time taken by ordinary means of transport. Whilst the use of the air mail between the United Kingdom and Argentina has shown a very appreciable increase in the last few years it is obvious that a much more marked expansion in its use could be obtained once the present rate of letter postage—four shillings per half ounce—could be reduced. There seems to be no likelihood of any reduction in these rates until the long-awaited—and, in fact, long-planned—British service to South America comes into being. Every week of delay will make the final international negotiations more difficult and much more costly. Even a year ago the scheme would have been more easily carried through.

THE ROYAL AIR FORCE

SERVICE NOTES AND NEWS — AIR MINISTRY ANNOUNCEMENTS

NO CORONATION REVIEW

In reply to a question in the House, Sir Philip Sassoon stated that there would not be a Coronation review of the R.A.F., but that the King intends to be present at the Hendon Display on June 26.

FORMATION OF NO. 12 (FIGHTER) GROUP

No. 12 (Fighter) Group will form, in the Fighter Command, at Uxbridge on April 1, 1937, and move to Hucknall by May 5, 1937, on which date it will take over the executive command of the following: R.A.F. Station and units at Church Fenton; R.A.F. Station and units at Debden; R.A.F. Station, Catterick; No. 41 (Fighter) Squadron, Catterick; No. 25 (Fighter) Squadron, Hawkinge.

THE SINGAPORE EXERCISES

Imposing manœuvres to test the Singapore defences were held last week, Navy, Army and Air Force units taking part. The attacking force had the aircraft carrier *Hermes*, while the defending Air Force consisted of Nos. 36 and 100 (T.B.) Squadrons, Nos. 203, 205 and 230 (F.B.) Squadrons, and Nos. 11, 27 and 84 (B.) Squadrons.

PERMANENT COMMISSIONS FOR MEDICAL OFFICERS

The undermentioned medical officers have been selected for permanent commissions:—Flt. Lts. Anthony Sterry Amsden, M.R.C.S., L.R.C.P., Archie Watson Smith, M.B., B.S., Robert Louis Soper, M.R.C.S., L.R.C.P., D.A., and Hilton Leonard Willcox, M.B., Ch.B.

LONG SERVICE AND GOOD CONDUCT MEDAL

The Long Service and Good Conduct Medal has been awarded to the undermentioned airmen:—

W.O.s Hutton, C. J., and Turner, C.E., M.B.E., W.O.2 Morgan, W., Flt. Sgts. Bell, S. H., Bosworth, C. H., Bowen, D. I., Bramley, F. B., Brewer, H. S., Carver, P. B., Coleman, P. E., M.M., Collins, W. J., Cook, H. F., Evans, H. R., Forsythe, D., Goude, J., Greeff, J. F., Healy, P., Hill, T., Holliday, A. J., M.M., Howard, C. J. Howard, G. B., M.M., Hughes, H. G., Hunter, R. T., Kemp, S., Killington, B. W., Langston, C. E., Lloyd, H. T., MacLachlan, J., McRae, C., Martin, R. T., Morrison, G. E., Osborne, J. K., Pope, J. P. E., Pugh, A., Rowbotham, A., Willis, H. J., Young, T. G. W., Sgts. Aldous, B. J., and Badley, F. A., A./Sgt. Bains, J., Sgts. Biggs, E. L., Bishop, E. S., Brereton, W., A./Sgt. Brown, E. A., Sgts. Brown, J. E., Cathcart, W., Chard, F. J., A./Sgt. Chrippes, A. W., Sgt. Cook, W. B., A./Sgt. Cox, W. H., Sgts. Currie, J. B., D.C.M., Dyche, H., A./Sgt. Eales, S. J., Sgt. Everest, H. G., A./Sgt. Foster, A. A., Sgts. Green, W. H., Herd, A. F., Humphrey, W. F., Hunt, A. J., Jones, W. F. L., Knight, W. G., Lawson, A. H., Lovell, F. S., McCarthy, D. M., Macartney, G., Perry, G. H., Price, J. G., Southwell, W., A./Sgt. Talbut, E. A., Sgts. Telfer, J. W., Weatherall, F. W., White, E. H., Wright, H., A./Sgt. Wynne, A., Sgt. Yarrow, T. V., Cpls. Blythe, J. W., Bull, C. H., Corrigan, J., Devereux, P. J., Glue, C. E. H., Harris, H. E., Hastings, R. H., Heybourne, H. W., Jewitt, A. Jones, W. J., Judson, W. E., Martin, G. W., Morehen, F. D., O'Brien, D., Palliser, F., Read, J. V., Simpson, F. B., Welch, W. T., Westwood, J., Woolstencroft, A. S., L.A./C.s Davis, R. E. M., Nash, R., Sullivan, R.

ROYAL AIR FORCE GAZETTE

London Gazette, February 2, 1937.

General Duties Branch

Flt. Lt. A. H. Marsack is granted a permanent commission in that rank (June 1, 1936); Sub-Lt. M. R. North, R.N., is granted a temporary commission as a Flying Officer on attachment to the R.A.F. (January 17).

The following Acting Pilot Officers on probation are confirmed in their appointments and graded as Pilot Officers (Jan. 27):—J. C. Betts, B. E. R. Bowden, C. A. Butler, J. H. D. Chapple, C. L. F. Colmore, G. V. Cook, K. D. Currie, N. F. Eagleton, J. S. Laird, D. St. Q. Robinson, G. V. Smither, R. D. Tate, B. J. Thomas, N. M. Thomas, T. R. Thomas, E. R. White.

The following Flight Lieutenants are promoted to the rank of Squadron Leader (February 1):—A. H. Willetts, D. F. W. Atcherley, R. A. A. Cole, P. G. Chichester, R. T. Taaffe, E. D. MacL. Hopkins, N. W. F. Mason, E. C. de V. Lart, S. H. Hardy, T. G. Pike, O. R. Pigott, N. S. Allinson, H. M. S. Wright, G. D. Harvey, D.F.C., A. King-Lewis, H. D. Spreckley, E. A. Healy, G. W. Hayes, L. Dalton-Morris, F. G. Cator, N. Young, G. P. Chamberlain, J. F. F. Pain (Lt., R.A.R.O.), F. P. Smythies, F. E. Nuttall, J. M. Cohu, J. H. Woodin, C. W. L. Trusk, A.F.C., C. F. H. Grace, J. E. G.-H. Thomas, D.F.C., G. B. Beardsworth, W. T. Holmes, H. S. Nowell, S. H. V. Harris, C. S. Cadell, G. C. Stemp, L. W. Dickens, A. D. Gillmore, F. S. Hodder, G. N. J. Stanley-Turner, J. L. F. Fuller-Good J. A. Tindall.

The following Flying Officers are promoted to the rank of Flight Lieutenant on the dates stated:—T. G. Lovell-Gregg (seniority October 1, 1936) (December 30, 1936); T. L. Moseley, R. R. Fairweather, D. Finlay, P. L. Donkin, P. W. Bale (January 15).

The following Pilot Officers are promoted to the rank of Flying Officer on the dates stated:—F. H. Roberts (December 16, 1936); H. E. C. Boxer, W. A. A. de Freitas (January 27).

Wing Cdr. H. S. Powell, M.C., is placed on the half-pay list, scale B (February 1); Flt. Lt. B. H. Godfrey is placed on the retired list on account of ill-health (July 8, 1936) (substituted for the notification in the *Gazette* of July 7, 1936); Flt. Lt. P. A. de G. Tettenborn is transferred to the Reserve, class A (January 23). The notification in the *Gazette* of December 1, 1936, concerning Acting Pilot Officer on probation R. W. Stanway is cancelled.

Equipment Branch

The following Flight Lieutenants are promoted to the rank of Squadron Leader (February 1):—C. N. Scott, L. J. V. Bates, W. Bourne, F. B. Ludlow, O.B.E., M.C.

The following Flying Officers are promoted to the rank of Flight Lieutenant (January 10):—E. N. Lowe, G. C. Allen.

The following Pilot Officers on probation are confirmed in their appointments and promoted to the rank of Flying Officer (January 6):—R. F. Folley, L. A. Jackson, F. G. Metcalf.

Accountant Branch

The following Flight Lieutenants are promoted to the rank of Squadron Leader (February 1):—B. L. Blofeld, D. J. Sherlock.

Sqn. Ldr. J. H. B. Carson is placed on the retired list at his own request (January 28).

Chaplains Branch

The Rev. J. G. Sherry is granted a short service commission with the relative rank of Squadron Leader with effect from and with seniority of January 25.

Commissioned Engineer Officer

Flying Officer on probation H. J. Sanders is confirmed in his appointment (January 18).

ROYAL AIR FORCE RESERVE

Reserve of Air Force Officers

General Duties Branch

The following are granted commissions as Pilot Officers in Class AA (February 2):—P. C. W. Disney, G. R. Tench, S. R. C. Wood.

Flt. Lt. C. C. Clark (Lt., R.A.R.O.) is transferred from Class C to Class A (July 23, 1936). The notification in the *Gazette* of April 14, 1936, concerning Flt. Lt. G. Rose is cancelled.

SPECIAL RESERVE

General Duties Branch

C. M. B. Archibald is granted a commission as Pilot Officer on probation (January 1).

AUXILIARY AIR FORCE

General Duties Branch

No. 503 (COUNTY OF LINCOLN) (BOMBER) SQUADRON.—O. Hellyer is granted a commission as Pilot Officer (November 10, 1936).

Equipment Branch

The following Flying Officers are granted the rank of Flight Lieutenant:—L. F. Caunter (Flt. Lt., R.A.F.O.) (May 12, 1936); M. R. Preece (Flying Officer Retired) (January 5).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

Air Vice-Marshal.—R. E. C. Peirse, C.B., D.S.O., A.F.C., to Directorate of Operations and Intelligence, Air Ministry; on appointment as Director of Operations and Intelligence and Deputy Chief of the Air Staff, vice Air Vice-Marshal C. L. Courtney, C.B., C.B.E., D.S.O., 25.1.37.

Wing Commanders.—H. G. W. Lock, D.F.C., A.F.C., to R.A.F. Station, Biggin Hill; to command vice Group Capt. E. O. Grenfell, M.C., D.F.C., A.F.C., 23.1.37. L. M. Iles, to No. 102 (Bomber) Squadron, Finningley; to command, 21.1.37. A. D. Pryor, to R.A.F. Station, Bicester; to command, 21.12.36.

Wing Commanders.—R. S. Sorley, O.B.E., D.S.C., D.F.C., to Directorate of Organisation, Air Ministry, vice Wing Cdr. W. B. Hargrave, O.B.E., 17.1.37. C. R. Carr, D.F.C., A.F.C., to H.M.S. "Eagle," for duty as Senior Air Force Officer, 18.1.37. G. C. Gardiner, D.S.O., D.F.C., to No. 216 (Bomber Transport) Squadron, Heliopolis; to command, 11.1.37.

Squadron Leaders.—C. B. R. Pelly, M.C., to Directorate of Operations and Intelligence, Air Ministry, vice Wing Cdr. H. D. O'Neill, 16.1.37. W. E. G. Mann, D.F.C., to Headquarters, R.A.F., Palestine and Transjordan, Jerusalem; for Air Staff (Operations) duties, vice Sqn. Ldr. W. A. D. Brook, 11.1.37. C. Walter, to No. 17 (Fighter) Squadron, Kenley; to command, 20.1.37. R. A. R. Mangles, to Headquarters, No. 6 (Auxiliary) Group, London; for Armament duties, 14.1.37. O. B. Swain, to Superintendent of the Reserve, Hendon; for armament duties, 15.1.37. W. Badley, to No. 9 F.T.S., Thornaby; for engineer duties, 25.1.37.

The undermentioned officers are posted to the R.A.F. Staff College, Andover, for the Staff Course, with effect from 19.1.37:—*Squadron Leaders* R. L. Ragg, A.F.C., J. R. Addams, A.F.C., G. R. Beamish, J. W. Colquhoun, H. I. Cozens, F. J. Fressanges, C. R. Hancock, R. B. Jordan, D. Macfadyen, M. D. Ommanney, and W. A. Opie. *Flight Lieutenants* R. L. R. Atcherley, F. G. Cator, L. Dalton-Morris, I. J. Fitch, C. M. Heard, F. S. Hodder, W. T. Holmes, T. N. McEvoy, G. F. Macpherson, F. M. V. May, A. H. Montgomery, M.B.E., J. Norwood, W. F. Pharazyn, T. G. Pike, A. C. H. Sharp.

Flight Lieutenants.—R. P. Cauthery, to Deputy Directorate of Repair and Maintenance, Air Ministry, 18.1.37. C. H. B. Bullock, to Air Armament School, Eastchurch, 18.1.37. J. L. H. Fletcher, to No. 600 (City of London) (Fighter) Squadron, Hendon, 18.1.37. K. F. T. Pickles, to Marine Aircraft Experimental Establishment, Felixstowe, 18.1.37. H. C. Adams, to R.A.F. Station, Bicester, 21.12.36. T. Q. Horner, to No. 8 Flying Training School, Montrose, 19.1.37. M. F. D. Williams, to H.M.S. *Courageous*, 18.1.37. J. M. Cohu, to Central Flying School, Upavon, 18.1.37. A. C. Martin and H. Ford, to Air Armament School, Eastchurch, 18.1.37. W. N. Blain, to No. 4 Flying Training School, Abu Sueir, Egypt, 11.1.37. H. W. Pearson-Rogers, to Headquarters, R.A.F., Middle East, Cairo, Egypt, 11.1.37. A. H. Willetts, to Headquarters, R.A.F., Middle East, Cairo, Egypt, 11.1.37. J. O. W. Oliver, to No. 4 Flying Training School, Abu Sueir, Egypt, 28.12.36. J. N. Jefferson, to Straits Settlements Volunteer Air Force, Seletar, 16.1.37. A. E. Louks, to H.M.S. *Eagle*, 1.2.37. A. H. Wheeler, to Headquarters, R.A.F., Aden, 3.1.37. R. C. Field, to Headquarters, R.A.F., Far East, Singapore, 26.12.36. I. McL. Cameron, to No. 139 (Bomber) Squadron, Wyton, 25.1.37. G. Lacey, to Home Aircraft Depot, Henlow, 27.1.37. W. W. E. Oliver, to No. 17 (Fighter) Squadron, Whyteleafe, 28.1.37.

Flying Officers.—H. C. Bazeley, to School of Army Co-operation, Old Sarum, 15.1.37. P. A. McWhannell, to School of Air Navigation, Manston, 15.1.37.

The undermentioned are posted to No. 1 Flying Training School, Leuchars, on appointment to temporary commissions on being seconded to the R.A.F. from the Army with effect from 6.1.37:—T. Adams, B. B. St. G. Daly, J. C. T. Gardner, R. H. N. Graham, N. B. Hallmark, M. J. Muspratt-Williams, and G. F. Watson-Smyth. G. J. I. Clennell, to No. 52 (Bomber) Squadron, Abingdon, 18.1.37. G. T. Toland, to No. 144 (Bomber) Squadron, Bicester, 11.1.37.

Pilot Officers.—D. W. Balden, to No. 800 (Fleet Fighter) Squadron, 6.1.37. J. N. Dowland, to No. 144 (Bomber) Squadron, Bicester, 11.1.37. V. E. Marshall, to No. 52 (Bomber) Squadron, Abingdon, 18.1.37. D. E. C. Eyres, to No. 43 (Fighter) Squadron, Tangmere, 4.1.37. M. V. Peters-Smith, K. L. Ashfold, to Air Observers' School, North Coates, Fitties, 7.1.37.

The undermentioned are posted to the Units stated on appointment to permanent commissions from the Royal Air Force College, Cranwell, with effect from 19.12.36:—T. D. Carnan, to No. 2 (Army Co-operation) Squadron, Hawkinge. M. C. Pearson, to No. 3 (Fighter) Squadron, Kenley. B. Barthold, W. A. Harris, to No. 4 (Army Co-operation) Squadron, South Farnborough. J. G. Fraser, to No. 13 (Army Co-operation) Squadron, Old Sarum. D. Weston-Burt, to No. 16 (Army Co-operation) Squadron, Old Sarum. R. M. B. D. Duke-Woolley, to No. 23 (Fighter) Squadron, Northolt. L. D. Wilson, to No. 40 (Bomber) Squadron, Abingdon. H. F. Burton, to No. 46 (Fighter) Squadron, Kenley. I. S. Soden, to No. 56 (Fighter) Squadron, North Weald. D. C. Milne, to No. 57 (Bomber) Squadron, Upper Heyford. P. E. S. F. M. Browne, to No. 66 (Fighter) Squadron, Duxford. R. S. J. Edwards, to No. 74 (Fighter) Squadron, Hornchurch. D. A. ffrench-Mullen, to No. 78 (Bomber) Squadron, Boscombe Down. N. C. Harding, to No. 166 (Bomber) Squadron, Boscombe Down. H. E. Bufton, A. R. Vaughan Williams, to No. 214 (Bomber) Squadron, Scampton. R. B. Carr, to No. 24 (C) Squadron, Hendon, 18.1.37. M. N. McF. Kennedy, to Electrical and Wireless School, Cranwell, 19.1.37. D. E. Bennett, R. H. McConnell, I. T. B. T. Rowland, to R.A.F. Station, Gosport. S. W. B. Menaul, to No. 21 (Bomber) Squadron, Lympne. S. P. Coulson, to No. 34 (Bomber) Squadron, Lympne. K. Ault, to No. 114 (Bomber) Squadron, Wyton. I. J. Fawdry, to No. 139 (Bomber) Squadron, Wyton. L. F. Cooper, M. H. Cox, L. W. Lowden, G. P. Robinson, to School of Air Navigation, Manston. A. D. Jackson, G. S. ff. Powell, to No. 47 (Bomber) Squadron, Khartoum.

Pilot Officer.—J. A. Richards, to Home Aircraft Depot, Henlow, 28.1.37.

Acting Pilot Officers.—P. C. Lemon, G. T. Palmer, J. R. T. Smalley, to No. 3 Flying Training School, Grantham, 16.1.37. G. C. Matheson, E. W. Campbell Colquhoun, J. K. Cannon, C. H. Clark, R. H. Dingle, G. Edwards, R. A. Field, R. C. Graveley, P. L. Gibson, J. B. W. Humpherson, J. E. F. Jacklin, M. T. Kirkwood, A. McL. Lyall, F. J. Lucas, I. F. McCall, D. Mackenzie, H. G. McDonald, J. M. Scott, N. M. McElligott, K. H. P. Murphy, A. G. Newton, T. W. T. McComb, D. L. L. Morris, J. B. Nicolson, H. E. H. Overall, D. W. H. Owen, T. M. Parker, H. W. Parker, H. W. Poultney, R. C. Simmons, G. H. Smith, M. A. Snowball, D. M. Stavely, A. D. Steele-Perkins, A. F. Smith, J. C. Whittall, A. P. Williams, H. G. K. Waring, J. S. Young, J. H. Williams, J. R. Cherry, W. C. G. Cogman, to No. 10 Flying Training School, Tern Hill, 16.1.37. R. M. Blennerhassett, D. O. Butler, J. B. McMichael, to No. 52 (Bomber) Squadron, Abingdon, 18.1.37. J. A. Crockett, to No. 9 (Bomber) Squadron, Scampton, 10.1.37. B. J. Thomas, to No. 40 (Bomber) Squadron, Abingdon, 10.1.37. H. P. Blatchford, P. D. J. Strong, to No. 41 (Fighter) Squadron, Catterick, 10.1.37. C. L. F. Colmore, to No. 43 (Fighter) Squadron, Tangmere, 10.1.37. N. G. Cooke, T. R. Thomas, to No. 46 (Fighter) Squadron, Kenley, 10.1.37. J. H. D. Chapple, to No. 49 (Bomber) Squadron, Worthy Down, 10.1.37. N. M. Thomas, to No. 57 (Bomber) Squadron, Upper Heyford, 10.1.37. C. D. Swain, to No. 83 (Bomber) Squadron, Turnhouse, 10.1.37. J. C. Betts, to No. 98 (Bomber) Squadron, Hucknall, 10.1.37. H. M. Crump, to No. 104 (Bomber) Squadron, Hucknall, 10.1.37. R. D. Tate, to No. 139 (Bomber) Squadron, Wyton, 10.1.37. J. M. Griffith-Jones, Ed. R. White, to No. 214 (Bomber) Squadron, Scampton, 10.1.37. S. McC. Boal, N. F. Eagleton, M. V. Longbottom, B. MacCallum, D. F. Spotswood, to No. 220 (General Reconnaissance) Squadron, Bircham Newton, 10.1.37. C. A. Butler, to School of Air Navigation, Manston, 10.1.37. B. E. R. Bowden, to R.A.F. Station, Gosport, 10.1.37. A. M. Brown, G. V. Cook, K. D. Currie, E. C. Inglefield, J. S. Laird, D. St. Q. Robinson, G. V. Smither, to School of Army Co-operation, Old Sarum, 10.1.37.

Equipment Branch

Wing Commander.—W. E. Aylwin, O.B.E., to Headquarters, Coastal Command, Lee-on-the-Solent; for Equipment Staff duties, 22.1.37.

Flight Lieutenant.—F. E. R. Dixon, M.C., to Directorate of Equipment, Air Ministry, 16.1.37.

Flying Officers.—The undermentioned are posted to the School of Storekeeping, Cranwell, on appointment to permanent commissions (on probation), with effect from 8.1.37:—W. Dalton, C. Darke, J. E. Hatfield, J. W. Lamb, H. F. Levell, W. R. McCleery, A.F.M., H. P. Simpson, M.M., E. J. Stephens, R. W. Ware, J. E. Watson, M.B.E.

Accountant Branch

Squadron Leader.—C. G. Prior, to Air Armament School, Eastchurch; for Accountant duties, vice Sqn. Ldr. J. H. B. Carson, 21.1.37.

Flight Lieutenant.—J. Lambie, to R.A.F. Station, North Weald, 18.1.37.

Flying Officers.—F. H. Shutt, to R.A.F. Station, Bicester, 21.12.36.

Pilot Officer.—J. B. H. Hobin, to R.A.F. Station, Bicester, 21.12.36.

Medical Branch

Wing Commander.—J. D. Leahy, M.C., to Headquarters, Fighter Command, Stanmore; for duty as Medical Officer, 25.1.37.

Wing Commander.—W. J. G. Walker, to R.A.F. Station, Halton; for duty as Senior Medical Officer, 22.1.37.

Squadron Leaders.—L. I. Hyder, to R.A.F. Station, Heliopolis, Egypt; for duty as Medical Officer, 21.12.36. F. L. White, to Headquarters, Bomber Command, Uxbridge; for duty as Medical Officer, 22.1.37.

Flight Lieutenants.—D. A. Wilson, to R.A.F. Hospital, Cranwell, 20.1.37. E. Donovan, to R.A.F. Station, Hemswell, 22.1.37.

Flying Officers.—E. W. R. Fairley, to No. 4 Armament Training Camp, West Freugh, 20.1.37. R. H. Pratt, to R.A.F. Station, Odiham, 20.1.37.

Flying Officer.—E. J. Moynahan, to R.A.F. Station, Tangmere, 28.1.37.

Dental Branch

Flying Officer.—J. H. G. Fensom, to R.A.F. Station, Odiham, 1.2.37.

Chaplains Branch

Revd. A. C. Gates, to No. 5 Flying School, Sealand, 19.1.37.

IN SEARCH OF GERMAN AND ITALIAN AVIATION

Over the Alps

ACROSS EUROPE in WINTER

By CAPTAIN NORMAN MACMILLAN, M.C., A.F.C., A.F.R.Ae.S., F.R.S.A.

CAPTAIN Norman Macmillan has recently completed a visit to German and Italian aviation centres. In a series of articles he will describe what he saw for readers of "Flight." The first article describes his journey by three regular and efficient air routes.

IT was raining heavily one Sunday morning when I arrived at the K.L.M. London offices, at the back of Thames House, and went through the usual formality of weighing-in preparatory to being transported to Croydon as a commercial air passenger.

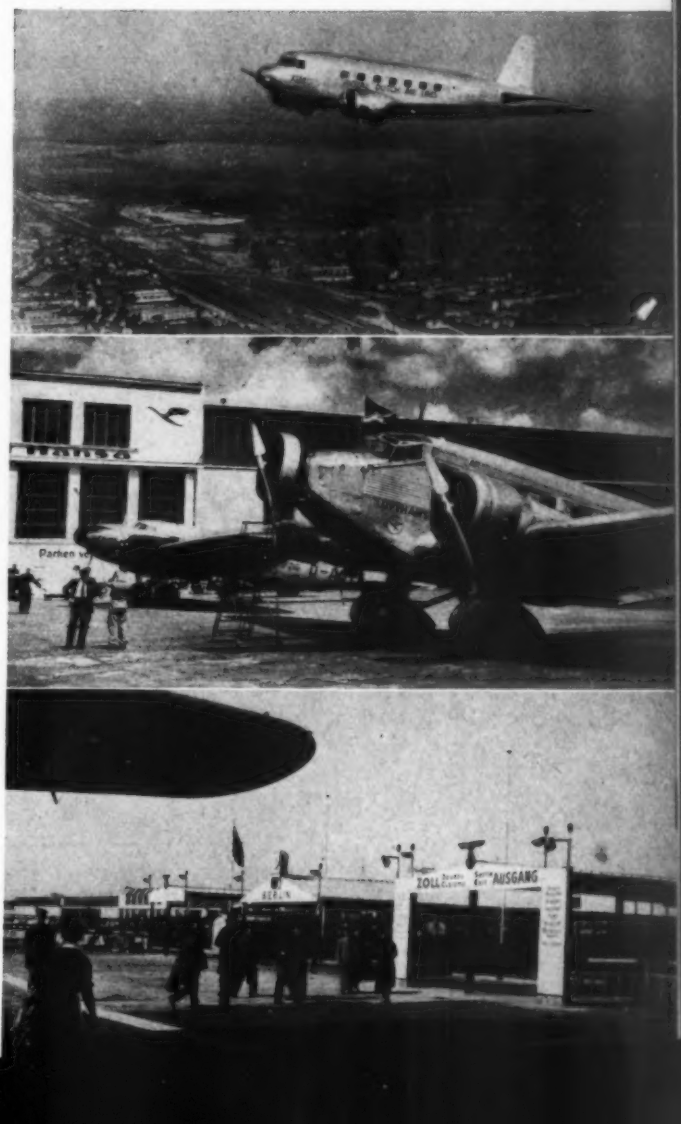
At Croydon the weather looked, if anything, worse. Low clouds were just above the trees on the hills to the south, and rain was simply teeming down on the concrete apron outside the booking hall. While we were clearing our passports K.L.M. Douglas D.C.2 PH-AKJ was standing on the tarmac with its engines ticking over.

I ducked my head, turned up my coat collar, and ran across the rain-drenched concrete and up the steps into the machine. There were thirteen passengers in the fourteen seats, two pilots up in front, and a steward, and almost before I had settled down we were off, practically straight from the tarmac.

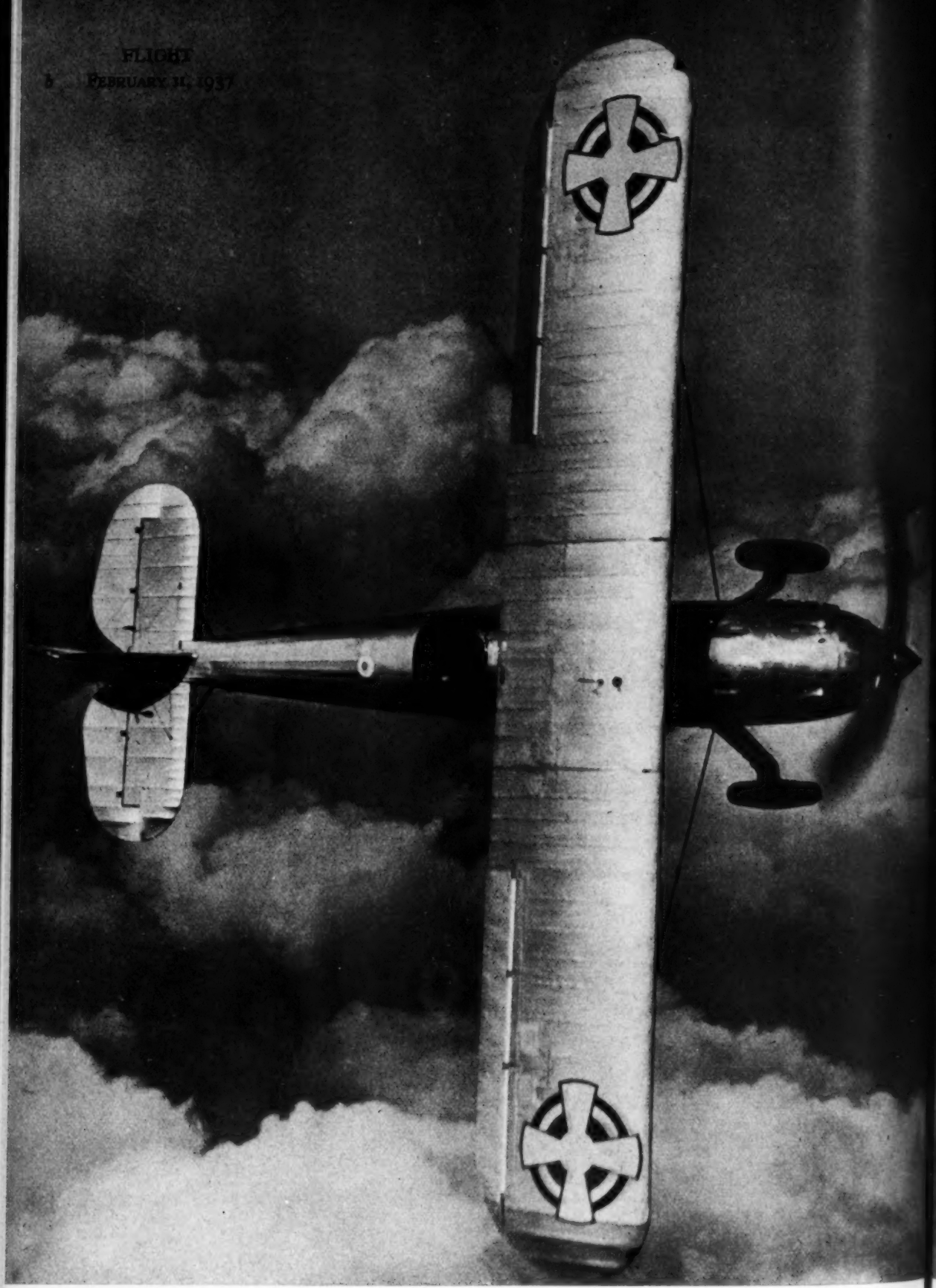
The seats in the D.C.2 were extremely comfortable. Their slope could be adjusted quickly and easily, a great convenience in an aeroplane, for one's sitting position changes between the ground and flight conditions.

It struck me that the Douglas, with her supercharged engines, took a considerable run before she left the ground, and her angle of climb over the trees on the rising ground to the south of the airport was not impressive to one who has flown much. We passed quite low above the trees into

(*Continued on page d.*)



(Right, top) A K.L.M. Douglas D.C.2. (Centre) A Deutsch Luft Hansa Ju.52 and Heinkel 111 at Tempelhof. (Bottom) Passenger gangways at Tempelhof.



"PLAYS SUCH FANTASTIC TRICKS
BEFORE HIGH HEAVEN" (Shakespeare)

The chief interest of these two remarkable aerial photographs is their testimony to the skill of the Hawker test pilots who enabled *Flight's* chief photographer to secure them. On the left, Mr. J. S. Hindmarsh had one of the Yugo-Slavia Hawker Furies (Kestrel XVI) in a vertical turn, while Flt. Lt. P. W. S. Bulman, flying the photographer in the Hart "-MR," broke away sharply to clear as the other side-slipped at the crucial instant ; and on the right the two machines dived in intimate company at 280 m.p.h.

Venice from the air. Capt. Macmillan, flying in thick fog, did *not* obtain this view.

the rain and mist-filled air, but before long we were above the clouds and heading eastward in the direction of the North Foreland at a height of 2,300 feet, and climbing slowly.

Nearing Manston Aerodrome we saw ahead a Hawker Hind, which changed position from the starboard side to the port and for a time flew alongside us as we maintained a steady course. There was not a bump in the sky as we crossed the North Sea at a height of 4,250 feet; and after what always seems to me a most monotonous trip we picked up the delta country of the flat coast of Holland, and soon afterwards glided down to Rotterdam Airport—a run of exactly an hour and a quarter at a speed of 165 m.p.h. from take-off to touchdown. When we got out to stretch our legs the air felt raw and cold, for the cabin heating in flight was almost too great.

Nine minutes later we were off again, straight from the tarmac towards the high wooden fence that runs round the airport of Waalhaven; again I noticed the long run of the Douglas before she unstuck. Just after the wheels were off the ground the second pilot in the front seat pumped vigorously, presumably to raise the undercarriage, which he evidently thought was better up as we approached the high wood fence. Or perhaps Mr. A. Plesman, the efficient managing-director of K.L.M., provides a bonus for his pilots on fuel consumption which makes them want to raise the undercarriage to reduce resistance at the earliest possible moment.

Fifteen minutes later we glided down from a height of 1,000 feet and landed at Schiphol Airport, Amsterdam.

I was bound for Berlin and, after clearing my passport, there was just comfortable time for a light lunch in the excellent restaurant at Schiphol. But there was not time for a regular meal. When I sat down and the waiter asked me what I would like to have, I looked at the clock and asked him what I could get quick and hot. In the self-same way that I remember every time I have made a quick lunch at Schiphol, he suggested: "What about bacon and eggs, sir?" Knowing their excellence, I agreed, and made a quick meal off a plate of them cooked in the Dutch fashion and served in the dish in which they were cooked.

In Mufti

The time for starting was nearly up when I finished. Calling the waiter for my bill, I asked him if time was not a bit short. He pointed to the burly back of a man sitting at the table in front, and said: "It is all right. There is no need to hurry. That is your pilot sitting there."

"Why is he not in uniform?" I asked.

The waiter smiled. "Oh, because he is a reserve pilot, not one of the regular Luft Hansa pilots. But he has an overcoat and a uniform cap."

It was a reminder of the German system of putting Air Force pilots on civil aircraft to learn their way about Europe under all conditions of weather.

Soon after, we climbed into Junkers Ju.52 D-ANAL and sped swiftly from the ground, with the remarkably quick start and rapid climb of that aircraft: up and off on to the straight-line course for Hanover.

At a speed of 137 miles an hour we climbed gradually to 3,300 feet, with the engines running (according to the tachometers) at slightly different speeds. The port engine gave 1,900 revs., the centre 1,800 and the starboard 1,860. Soon the altimeter recorded 4,000 feet and then 4,600. We levelled out to cruising speed, making 168 m.p.h. over the ground, down wind. The wind was light.

The sixteen-seater was full. In the forward cabin, where I sat, there was an electric cigarette lighter and an ashtray at my right hand, for in German-run aircraft of this type smoking is permitted. Halfway to the Dutch frontier we flew over clouds; soon they spread entirely across the flat countryside; the flight became a monotonous droning journey over a landscape of grey and white, until we saw the low range of the Hartz mountains projecting above the clouds. We came down through the clouds about five miles short of Hanover, flying blind for only a few minutes, crossed the airport, turned in what seemed an unnecessarily wide circuit, and landed one hour seventeen minutes after leaving Amsterdam, an average speed of 160 m.p.h. made good.

We taxied in to the airport buildings, tumbled out of the machine and walked into the administration building. All

the baggage in the luggage compartment was brought out in trucks. Then we cleared the Customs, our passports, and declared our money, receiving in return the official form that enabled us to take out of Germany what we did not spend. This took half an hour, and then we were in the Ju.52 once more, off for Berlin.

On one side of the aerodrome a line of Ju.52s was drawn up. From their dark paint they were obviously not Deutsche Luft Hansa aircraft. Their colour was typical of night bombers, but when I saw some similar aircraft at Tempelhof I was told they were railway transport machines.

It seemed that we were off none too soon, for the weather was steadily thickening as we climbed through mist and fog to a height of 3,300 ft. before we levelled out to 150 m.p.h. over the ground. Then we could see nothing but mist. The sun shone on it, sank below it, and darkness began to fall. No ground was visible below. Gradually the pilot brought the machine lower until we skimmed the clouds, with the undercarriage dipping into the higher banks and riding clear of the hollows. Slowly we passed into it and our vision faded. But only for a few minutes. Then we were below the clouds, with the lakes to the west of Berlin gleaming among woods, and the neon beacon winking on our left. Soon we swept through the smoky atmosphere of the German capital, flying low over its array of roofs, until the lights of Tempelhof came in sight. There followed the curious wide sweep that this particular pilot seemed to like before we glided down and landed, just as darkness fell, sixty-three minutes after leaving Hanover.

The total time in the air from London to Berlin was only 3 hrs. 50 min. The cost of the fare worked out at 55s. an hour and 4s. 3d. per mile.

The change from one machine to another made it possible to compare the older German type with the later one from America. The American, with its adjustable seats, was far more comfortable. The seats of the German were not adjustable, too upright for comfort, and rather hard. The marked noise of the Junkers was emphasised by the comparative silence of the Douglas, in which the gentle hum of flight was rather pleasing, and certainly more soothing than the intermittent jangle of a railway train.

After a number of visits to German factories and aerodromes (to be described in subsequent articles) I booked my passage by air from Berlin to Rome. Through going by air instead of by rail, I found that I saved between £7 and £8, as well as some fifteen hours of travelling time. In consequence, the air route between Berlin and Rome is popular with business men, and generally runs to a high passenger capacity.

The morning of the day I was due to leave dawned foggily. As I left the Adlon Hotel in the Unter den Linden the porter remarked that it did not look a very good day for flying.

A taxi ran me out to the airport in twelve minutes at a cost of 3 marks. The fog was thicker on Tempelhof, with visibility of the order of some thirty yards or so. Nevertheless, aeroplanes were departing to scheduled time in various directions.

The route from Berlin to Rome provides for a stop and Customs clearance at Munich, and a stop and Customs clearance at the Lido, Venice. I was told that the Rome machine would be delayed because Munich airport was completely fog-bound, worse than Tempelhof.

When I asked why there was need for delay in view of the blind-flying equipment possessed by German airports and air liners, I learned that a reserve pilot was scheduled to make the trip. It was not considered that he had sufficient experience to be entrusted to make a complete blind landing at Munich. Had he been one of the regular Luft Hansa pilots, my informant said, we should have left on time.

Half an hour later news from Munich gave no indication of improving conditions. The German service to Munich was cancelled. Passengers who had booked only to Munich were refunded their money so that they could catch a convenient train. Rome passengers were told that their machine would leave direct for Venice.

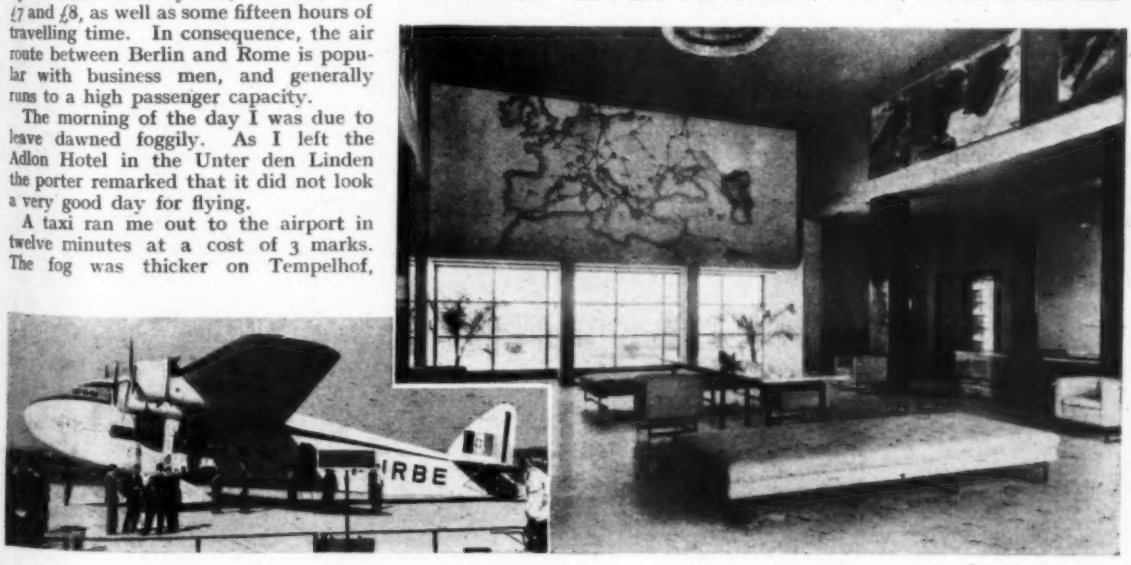
Into the Murk

The machine was an Ala Littoria (I-BIZI) manned by two Italian pilots and a wireless operator; it was a Junkers Ju.52, painted cream colour, just visible on the tarmac amid the swirling fog.

A Customs officer appeared and passed our baggage after inspecting it for currency. We declared our money on leaving the country. Our passports were duly stamped and we were free to board. There were only two other passengers—an elderly lady and gentleman, both making their first flight.

The engines were already running. The cabin was much warmer than the air outside. We swung round into position for take-off. The pilot opened up, and next moment we charged into a grey wall with nothing visible in front, on either side, or behind. I could just see the ground rushing dimly past below the trailing edges. Then that, too, disappeared, and we were completely enveloped in dense fog.

Steadily we climbed through it, and a few minutes later emerged above it at a height of 1,200 ft. As we climbed we saw the great belt of fog stretching in all directions about us, with no sign of ground anywhere. The sun shone gloriously in a pure blue sky, and, striking through the windows of the cabin, made it, with its exhaust muff



(Left) A Savoia S.74 of Ala Littoria. (Right) The lounge of the Lido Airport, Venice.

heating, almost too warm. I took off my hat and coat. Never have I experienced such a comfortable journey in mid-winter.

Among the fittings in this particular machine were two not usually found on British aircraft. One is standard on Ju.52s. It is a flexible tube with a metal nozzle containing a small steel ball as an automatic shut-off. When the ball is tapped back a thin stream of pure cold air from outside issues from the nozzle. If a passenger feels at all faint he can apply a stream of cool air about his face, and without causing a draught for others. It would be of use to me if exhaust fumes entered the cabin. The other fitting is carried on the trans-Alpine route. It comprises an oxygen bottle, together with nozzle equipment, so that those who feel faint owing to height can obtain a supply of oxygen. There are enough bottles to supply all passengers without leaving their seats.

Unlike the Junkers from Amsterdam to Berlin, the Italian 'plane carried a notice forbidding smoking; no cigarette lighters or ashtrays were provided.

After flying for some forty minutes a gap or two appeared in the fog belt below, and we could just see the winding course of the River Elbe. Then the fog filled in once more. Our next sight of the ground was near the frontier of Czechoslovakia, where the tops of the mountains projected above the fog. One solitary rounded hill-top, in German territory, was sprinkled with snow; its fir trees stuck out like quills. It looked like an enormous hedgehog wobbling its way through the fog, for our passage through the air gave it the optical illusion of movement.

Towards the Alps

In an hour we had flown 137 miles and climbed to just over 11,000 feet, with the engines running at 2,100, 2,200, and 2,100 r.p.m. A layer of cloud floated above us. We passed through it and saw still another layer above. The Alps, 160 miles away, stood up like a wall between the fog and the sky-line.

The fog on the ground appeared to be thicker, but at 13,500 feet we were so far above it that I could not estimate how high it was above the ground.

I heard the engines open out and went forward to read the tachometers. All three had gone up 50 revs. per minute. Our speed increased to 143 m.p.h.

There was no sign of Munich when the wireless operator passed back a note to say that it lay below, and that the wind was against us. We had covered 320 miles in exactly two hours.

Ahead the Alps grew straight out of the fog. Soon we were crossing the first of the rock walls. The mountains were free of cloud. Now, at a height of 14,750 feet, a magnificent panorama lay below. Great valleys opened out between huge mountains that rose up just below our wings. The crossed winding valley of the Inn disappeared, and the last chance of making a forced landing. I saw one little village precariously perched on a steep slope by the banks of a wildly rushing stream. Everywhere the hills were covered in snow except for the steepest escarpments where snow never lies. Over the Brenner we reached our greatest height—16,500 feet. Then we began to go slowly down.

I knew the Dolomites with their curious red colour and the columnar formation that marks that distinctive region. The red of the rock caught the rays of the sun. It shone vividly, like a splash of paint across an etching of black and white.

There was not a bump in the sky as, at 150 m.p.h., we swept steadily south over the hills that drop down to the Venetian plain. Below were the Brenta and the Piave rivers, known to our airmen who flew on the Italian front during the Great War. Fog filled the plain beyond. We could see nothing ahead. Behind rose the great mountain mass over which we had flown. Gradually we came lower with throttled engines until we were just skimming the top of the fog belt. Time and again I thought the pilot was about to enter the fog; but I was deceived by a steady billowing-down of its upper layer, a curious formation I have seldom seen.

At last I saw the sudden vertical break in the fog level which denotes a seaboard below. Just beyond it the pilot shut the engines right back. We entered the fog at a height of 1,200 feet. Steadily the altimeter in the cabin went down. Suddenly, about 200 feet below, we saw the sea apparently tilted up at an angle with little fishing boats on its upper edge—an optical illusion caused by the blind downward glide and the foreshortened horizon due to the fog.

A swift left-hand turn brought us over the Lido airport. Next instant the wheels were trundling along the ground. With hardly any taxying run we pulled up alongside the airport building and got out after an efficient flight of 3 hours 36 minutes at an average speed of 147 m.p.h. over 528 miles.

Although late in leaving Berlin, our non-stop journey had brought us to Venice ahead of schedule. After clearing Customs, passports and money, there was ample time for a comfortable lunch at the excellent airport restaurant.

Sixty-eight minutes later I was in the air again in another Junkers 52 (I-BAUS), this time with seven passengers. We swept off the ground down the long narrow airport, got a fleeting glimpse of Venice on the right, with its lagoon, canals and lovely buildings, before, in a swift climbing turn to the left, we entered the drizzle of fog.

The Russet Apennines

In a moment or two we were above it. Again there was the monotonous stretch of cloud with nothing to be seen but the Alps away to the right rear. I went to sleep. When I awoke we were above the Apennines. Their peaks stuck up through the clouds. On their farther side the fog retreated into cloud-filled valleys, and the lakes beyond were dimly visible.

Although I have flown over many parts of the world, above hills of all descriptions, I know that if I could be suddenly transported in an aeroplane, blindfolded and without knowing where I was going, and then my sight were released so that I looked down on the Apennines, Perugia and Assisi, I would know that the hills on which I looked were not Spanish, nor South American, nor Indian, nor hills of any other place but only those of Italy. Their bare and lovely russet colour, their sudden steeps and rounded slopes, the cities that nestle at their feet, the villages and castles that surmount their summits, their change to fawn where the stratum of the rock alters, are characteristic of a landscape that for loveliness of changing contour and variety of scenic beauty is unsurpassed.

Below us the muddy Tiber wound its tortuous course towards Rome. Villages became more frequent. Along a straight road motor cars seemingly crawled as our pilot came steadily lower. Near one wide bend of the river he headed off in a left-hand turn; looking through the right-hand windows, I could see the buildings of Rome.

Flying over Rome is not permitted. We caught but a glimpse of its nearer suburbs before we glided low above the river, then side-slipped over a bank of reeds and hedge into the airport of Littoria, 1 hour 38 minutes after leaving Venice—250 miles at an average 152 miles an hour.

In a few minutes we were in the Ala Littoria bus, and a quarter of an hour later we were in the heart of Rome itself. The air journey from London, through Amsterdam to Berlin, Venice and Rome impressed me with the efficiency of international civil air lines. It occupied a total flying time of only nine hours four minutes, a journey that by terrestrial transport would occupy forty-two hours.

But, when I wanted to return to England, there was no air service that would take me straight from Rome to London. This is a defect in the air routes of Europe that should be put right.

(*The next article in this series will describe a visit to the Reichsluftfahrtministerium.*)

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS

COLONEL LINDBERGH was received in Rome by Marshal Balbo last Thursday.

In view of an "unjustified delay" in the delivery of new military aircraft, M. Pierre Cot, the French Air Minister, has decided to requisition the Morane-Saulnier factory.

The headmasters of leading schools and the Air Ministry are reported to be discussing a scheme to give aeronautical instruction in public schools in addition to O.T.C. training.

The Airports and Airways Exhibition will be opened by Lord Swinton at the Royal Institute of British Architects, 66, Portland Place, London, W.1, on February 19. Admission will be free from February 20 to March 24 inclusive.

Twenty-five Years Ago

(From "Flight" of February 10, 1912.)

". . . the French Minister of War is expounding to his Parliament the details of his scheme for spending immediately a round million sterling on aircraft for warlike purposes. Germany is increasing her aerial fleet very largely. Italy is actually using dozens of aeroplanes in her war in Tripoli. Russia, Spain, Japan, China, America, Turkey—all the Powers of the earth, in fact—are buying aeroplanes to be used against the next enemy! It may be both deplorable and pathetic that immediately science succeeds in giving us something new, the first question to be answered is that of whether or not it can be turned to the purposes of wholesale murder—but then, that is human nature once more."

THE INSCRUTABLE SMILE: Several Avro 626s with Siddeley Cheetah engines have been supplied to the Egyptian Army Air Force, which has now ordered some Hawker Audaxes, as seen above, with Panther engines, presumably because of its experience with Siddeley products and not out of national gratitude for the well-known trade mark. Note how the Vickers gun mounting has been transferred outboard and the cowling grooved to clear the engine. (*Flight* photograph.)

It is likely that aeroplanes will bomb an eight-mile ice jam in the Morawa River, Yugoslavia.

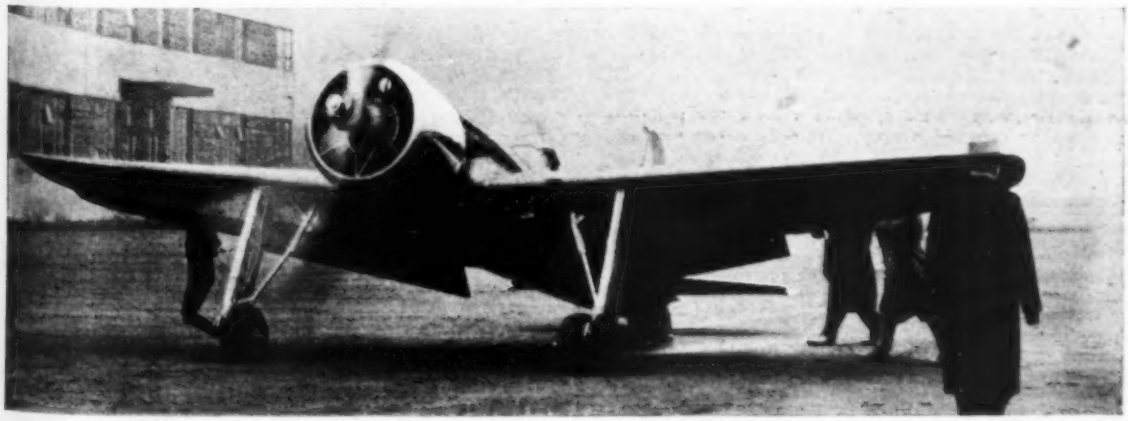
Miss Mabel and Miss Sheila Glass left Heston last Saturday in a Moth for Cairo, where they will take part in the third International Egyptian Aviation Meeting to be held from February 22-26.

Imperial Airways are experimenting with polarised light to remove unwanted reflections from the water when landing. A screen permitting only polarised light to pass is fitted in a convenient position for the pilot to place in front of his eyes when necessary.

Junkers are contemplating four-crankshaft Diesels of 1,500-2,000 h.p. with a specific weight of less than 1.1 lb. per h.p.

The new Northrop dive bombers being built for the U.S. Naval Air Service have 750 h.p. Twin Wasp Junior engines and retractable undercarriages.

The new twin-engined Beechcraft low-wing monoplane is now flying. On two seven-cylinder Whirlwinds, it cruises at 185 m.p.h. at 11,500 ft., with the engines delivering a total of only 420 h.p. In appearance the machine resembles the Lockheed "12."



HOT FROM HOLLYWOOD: The modified Hughes Special (Pratt and Whitney Twin Wasp Junior) in which Mr. Howard Hughes flew from Los Angeles to Newark, New Jersey, at an average speed of 332 m.p.h.

Topics of the Day

Changing Technique

ALTHOUGH it is always true to say that anyone who can fly a standard training biplane with accuracy and reliability can fly anything else with safety, the differences between certain machines are becoming more marked every year. The modern low-wing monoplane with a fairly high loading and split flaps, for instance, really requires an entirely new technique during the approach, and, more particularly, during the take-off.

This new technique is most forcibly demanded where large machines are concerned, and the only real reason why it is not so noticeably essential in the case of smaller fry is that the control loadings are smaller. Nevertheless, for a reasonably short take-off run with any low-wing light aeroplane it is necessary to work according to the rules.

In general these demand a tail that is well up during the first part of the run and lowered as soon as a fair amount of speed has been obtained. Alternatively, one can keep the tail moderately well up all the time and then pull the machine off when the A.S.I. shows anything in excess of the stalling speed, afterwards levelling out momentarily if the machine is low-powered.

Some machines will refuse to leave the ground at all unless they are hauled off, since the undercarriage drag is sufficient to keep the speed down below that at which they will, in fact, fly off by themselves. The modern pilot is learning to fly more and more on his A.S.I. and less on "feel"—for there is no "feel" at lower speeds.

As an extreme example I might quote the case of a large low-wing monoplane of which I have had a little first- and second-hand experience. This monoplane requires forward pressure on the control when the throttles are opened; as the speed increases the load on the control decreases, and it is sometimes necessary to ease it back a trifle. Immediately after the machine has been pulled off, the load on the control is reversed and it must be held forward again as the trimmer is quickly wound while speed is gathered. The reason is quite simple. While on the ground the downwash from the centre section is deflected up at the tail, but as soon as the machine is airborne this artificial lift departs and the whole thing is then tail-heavy. In a smaller way I have noticed this peculiarity while doing a flap-down take-off on a light low-wing machine.

Compensations

HOWEVER, in exchange for this exercise of special technique we are getting nearer and nearer to the machine which, one hopes, will be entirely viceless at very low speeds and, so far, certain low-wingers have been the only machines (apart from those with rotating wings) to approach this ideal.

There is nothing new about it. The old original Klemm had very similar characteristics to those found in machines like the present Swallow and the Miles Straight. Yet another method of attack is to design a machine like the Hornet Moth, which, though rather less harmless at very low speeds, will recover instantaneously from the incipient beginnings of a spin. If something really does start I would rather have the quick-recovery characteristic, but the point is that nothing *should* start if no silly tricks have been played with the luggage load. Place 200-odd pounds in its rear locker and the safest machine will try to bite its tail when severely mishandled.

There have been machines flying about for years which are as safe as houses when left severely alone. A long time ago a certain fairly well-known owner bought a small low-wing machine. He had watched his instructor taking this monoplane up in a very steep climb, and when he took over for the first time he endeavoured to emulate him—but overdid it. As soon as the lateral control faded away he is reported as having thought, "Dear me, they have forgotten to connect my ailerons," and promptly switched off. This remarkable aeroplane then sank firmly back on to the ground and merely bent its axle. The instructor immediately took his pupil up in every machine he could find and, at a safe height, did the same thing with each—just to show that aeroplanes are not all the same.

Which reminds me of the case of a now famous designer who once found himself quite accidentally in the air with a war-time derelict on which neither the switches nor the throttle would work, and on which the ailerons really were *not* connected. He came down into a very small aerodrome with the help of a previously checked time-factor and the only engine control which did work—the fuel tap. He still flies heartily and often.

Making Allowances

A FEW days ago I was grateful for the fact that I had long ago been taught always to glide into strange aerodromes with a little more speed than usual—particularly when the wind is strong. In this case I was coming in over a fence which lay in a slight dip. Just as I crossed it the air speed dropped from 65 m.p.h. to 50 m.p.h., and the landing was made in one swift, sweet movement.

The manœuvre looked clever; in fact I had been caught in a "dead-air" region near the ground where the 25 m.p.h. wind just faded out to nothing. Hence, perhaps, a good deal of this "down-draught" talk; the effect is the same. I felt as if the whole machine had been pressed bodily into the earth; the landing was absolutely final and the ground run was a matter of yards.

During the same trip, in the comfort of a Hornet Moth's cabin, I played occasionally with the latest type of Simmonds-Goudime calculator, which is described on p. 150.

My criticisms in practice concern the necessary smallness of all the markings and the fact that both hands are necessary for its operation. As a ground calculator it is admirable—and courses are usually worked out before departure.

INDICATOR.

FROM the CLUBS and SCHOOLS

LONDON

THE flying time for last week was 29 hr. 5 min. Mr. A. T. Loch has joined the Club as a member.

LIVERPOOL

Flying times for January aggregated 122 hr. 5 min., this figure showing a considerable increase over the corresponding period of last year. For the year ended December 31, 1936, Club aircraft flew 2,555 hr. 8 min.

DONCASTER

In spite of adverse weather conditions the Club machines put in 10 hr. 45 min. for the week ended January 31. Mr. M. J. McCloskey has joined as a new member. The Club is holding its second annual dinner and dance on Thursday, February 23.

LEICESTERSHIRE

Bad weather prevailed during January at Leicester and kept flying times down to 28 hr. 25 min. Six cross-country flights were made, while twenty-three aircraft of various types visited the aerodrome. Mr. D. C. H. Weir has passed his "A" licence tests. The Club has acquired a new B.A. Cirrus Swallow (G-AESI).

BRISTOL AND WESSEX

During January members of the Bristol and Wessex Aeroplane Club flew 53 hr. 15 min. The Club Cadet has now returned from Heston after a complete engine overhaul and repainting. A demonstration of the Miles Whitney Straight will be given on February 14. The flying times for last week amounted to 18 hr. 15 min.

SOUTH COAST

In spite of very bad weather, nearly 20 hours' flying was logged during the week. "B" licence candidates are getting busy on cross-countries, and Mr. Stevens last Monday week visited Reading, Sywell, the Fen District and Brooklands. An informal dance is being held on February 20 at the airport.

MIDLAND

Flying times for the fortnight ended February 5 amounted to 13 hr. 40 min. dual, and 14 hr. solo and passenger. Flying had to be cancelled on many days owing to bad weather. Cross-countries were carried out to Shoreham, Braunstone, Croydon and Heston. Miss C. M. Hughes has joined the Club as a flying member, while Mr. S. Baker has carried out his "A" licence tests.

CINQUE PORTS

During the intervals of moderately good visibility the Club was able to collect the three machines which were weather-bound at Hanworth and Croydon last week. The new Tiger Moth was brought from Croydon by Mr. K. K. Brown and is now in the workshops being "smartened up." Mr. C. G. Alington is starting off on a flight to Egypt in Messrs. Edwards' Monospar, which has been housed with the Club for some time.

NORFOLK AND NORWICH

Adverse weather conditions throughout the week interfered with flying activities. Notwithstanding this a total of 25 hours was flown by members. On February 3 the Miles Whitney Straight was demonstrated. Flt. Lt. Bullmore spent most of the afternoon in it with various members. Mr. Carter, who recently qualified as a ground engineer, is undergoing an advance course of ground engineering with a view to increasing his qualifications. Members are reminded that the tenth anniversary dinner takes place on February 25.

PORTSMOUTH

Unfavourable weather kept flying times down to 11 hr. 55 min. during the week ended February 5, and flying instruction was not possible on five days. The fifth and last monthly dance of the season was held in the Club lounge on February 3, and over one hundred and twenty members and their guests attended. Mr. A. Townsley has joined the Club.

It is interesting to note that the Portsmouth Aero Club's fleet made 2,911 flights, totalling 1,333 hr. 50 min., during last year ended December 31, 1936.

BROOKLANDS

Bad weather again reduced flying time to 60 hours, but there were several new members during the week, namely, Messrs. Metford, Hartmann and Kidston. Mr. Kidston, a brother of the late Lt. Cdr. Glen Kidston, is taking the blind-flying course. The Puss Moth is now back at the aerodrome after its stay at Shoreham. During the week the Westland Wessex of Imperial Airways Training School landed at the aerodrome with a damaged airscrew. A spare was flown over from Croydon and fitted on the spot. There was a sequel to the incident when, in the afternoon, a certain newspaper rang up the aerodrome to ask if it was true that an Imperial Airways "giant air liner" had landed at Brooklands with a "blazing propeller"!

YORKSHIRE

Members of the Yorkshire Aeroplane Club flew 28 hr. 25 min. during the month of January, bad weather prevailing most of the time. The flying for the past week totalled 10 hr. 15 min.

HERTS AND ESSEX

January's flying times totalled 143 h. 43 min. During the fortnight ended February 4 only eight days were available for flying and 58 hr. 23 min. were logged. Mr. Mollison visited the Club during the latter week.

CAMBRIDGE

Flying times at Marshall's Flying School for the week ended February 7 totalled 72 hr. 35 min. New members are Messrs. Bury, Chesswell, English and Ramsay. Messrs. Bridge and Simpson have passed the tests for their "A" licences.

C. A. S. C.

Last week-end, in spite of continuous rain, members flew 12 hr. 40 min. Mr G. H. Chessell took his initial flight with the Corps. Arrangements are well in hand for No. 4 (Kent) Squadron to take training in the near future at Gravesend Airport.

SOUTHEND

There has been increased activity on cross-country work at the Southend Flying Club. Mr. C. F. Ball has gone solo, and an "A" licence has been obtained by Mr. Cotton. There will be a dance at the clubhouse on February 13, and a special Sixth Birthday dance and cabaret on February 27.

REDHILL

Hours for the week ended February 5 amounted to 30 hr. 40 min. Messrs. Brumfitt and Stewart have gone solo, while Messrs. W. F. Rathbone and J. K. Maxwell have completed all the tests for their "B" licences. Mr. J. D. Harris has completed his night flying tests for this licence.

YAPTON

Flying times for February to the 6th were 12 hr. 40 min., the machines having worked hard in the very few intervals between the bad weather spells. Mr. J. Matthews has joined the Club as a new member and is taking the £15 "A" licence course. Mr. L. Manilal has gone solo, while Mr. R. A. Hubbard has passed his height test.

MALLING

In spite of the appalling weather in January the Club machines completed 58 hr. 10 min. flying during the month. The landing competition for the McCarthy Cup was won by Mr. K. Vinson. Mr. Copley has passed his "A" licence tests and there are four new flying members.

A. S. T.

During January an epidemic of influenza and the indifferent weather affected the number of flying hours and only 954 hours were flown. Three ground engineering pupils have completed their training and have immediately secured posts. Air Service Training continues to expand, the construction of new lecture rooms and an assembly hall having been commenced.

LEEMING

A large number of very enthusiastic members attended York aerodrome last Friday afternoon and Saturday when demonstrations were gives on the Miles Whitney Straight aircraft by Mr. R. Malone. New pupils are Mr Rowntree and Mr. Brownstone, while Mr. Hall has joined the Club as a member. Flying time for the week ended February 6 totalled 30 hr. 40 min.

HANWORTH

New members are Messrs. A. S. Halls, C. Smith (National League of Airmen), Wilson, Hill and Englebach. Mr. H. Vilen has gone solo. Cross-country flights have been made to Shoreham, Northampton and Gravesend. The Club Leopard Moth was hired during the week for film purposes, and another Club machine, with pilot, was hired by another company at Aldenham. An Aeronca was demonstrated at Northampton during the week. Mr. John Kirwan is now helping with instruction. Flying time for last week amounted to 59 hr. 40 min.

BORDER

Practically all the past week was given over to the search for the ill-fated Dragonfly. All the Club machines were out from dawn to dusk, covering the Cheviots, Pennines and the Lake Hills. Weather conditions made it extremely difficult for the aerial searchers. Clouds were under 1,000 ft. most of the time, and on occasions machines were forced down to within 100 ft. of the ground. Strong winds and heavy rain added to the pilots' difficulties. Altogether the Club machines flew over 20 hours in the search, and credit is due to the pilots, Flt. Lt. Potter, Messrs. R. S. A. Beauchamp, W. B. Thompson and A. Campbell, and to the observers, Messrs. T. Hodgson, R. Routledge, M. Thompson, T. S. Robinson and J. M. Bell, who gave up their ordinary jobs to take part.

Private Flying

KARACHI

December was a busy month for the Club and flying time amounted to 237 hours. The major portion of this was spent on training members who wish to qualify for their "B" licences. Two members obtained their "A" licences *ab initio* during the past month, five members renewed their "A" licences, and one obtained his Second-Class Navigator's licence. The training of three "B" licence pilots as pilot instructors was also carried out during the month. The ground engineering staff and the students have been kept very busy, two of the Moths being under complete overhaul for the renewal of the C. of A. The Club was honoured by His Excellency the Governor of Sind, who chartered the Club's Leopard Moth, piloted by Major Jones, for a flight from Hyderabad and back on the occasion of the proclamation of the accession to the throne of H.M. King George VI. Cross-country and charter flights during the month were carried out to Bombay, Baroda and Hyderabad.

A Bristol Occasion

SOMETHING like 250 members and guests attended the Bristol and Wessex Club's annual dance last Thursday, though the rooms at the Berkeley, Bristol, where the party was held, were sufficiently extensive to prevent any sign of overcrowding. Were it not for the fact that the same face rarely appeared twice in the same spot, a visitor might have imagined that the enthusiast who did the counting was watching a process similar to that seen on the Shakespearean stage when the army of Brutus is marching by—out at one end and back at the other.

After supper came the Western Brothers and one wondered whether anyone had previously noticed that the stouter of the brothers shows, when on the stage, a truly remarkable resemblance to a certain well-known figure in aviation—when this figure is also "holding the stage." Anyway, they were as funny as usual and the party itself was very much alive until the arrival of the mythical carriages at 2.30 a.m.

Vacuum Flaps

IN the article dealing with the Miles Whitney Straight which appeared in last week's issue, readers will recollect mention of the flap-operating gear. The exact designation of this system is the Theed Vacuum Flap Actuation Gear; the same equipment marketed in France by Aerocessories Simmonds is known as the Simmonds-Theed Control.

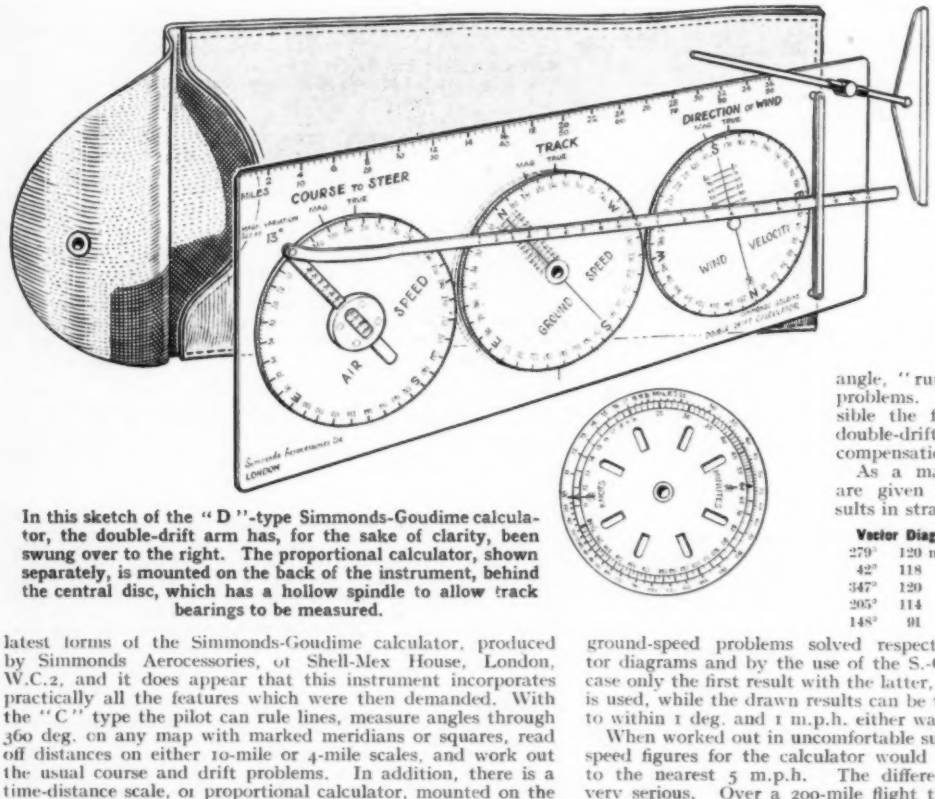
AN "ALL-IN-ONE" C.D.C.

The Latest Simmonds-Goudime Course and Double-Drift Calculator

A FEW weeks ago I spoke in my weekly comments of the need for some self-contained calculating instrument which, within reason, would perform all the work involved in laying off and measuring courses, in correcting for drift, and in estimating an approximate time of arrival at any point on one's track.

Since that time I have had a chance of using one of the latest forms of the Simmonds-Goudime calculator, produced by Simmonds Aerocessories, of Shell-Mex House, London, W.C.2, and it does appear that this instrument incorporates practically all the features which were then demanded. With the "C" type the pilot can rule lines, measure angles through 360 deg. on any map with marked meridians or squares, read off distances on either 10-mile or 4-mile scales, and work out the usual course and drift problems. In addition, there is a time-distance scale, on proportional calculator, mounted on the underside of the instrument, and the more expensive "D" type has an extension arm with a lined celluloid strip to enable one to solve what are known as double-drift problems, whereby the speed and direction of the prevailing wind at cruising altitude may be quickly obtained while in flight. The latter part of the instrument is, of course, only likely to be useful to more serious navigators, but, once mastered, the method is a very easy one.

Although very different in appearance from the normal circular C.D.C., the principle behind the Simmonds-Goudime is precisely the same. Instead, however, of making an actual vector "model," the course, track and wind lines are separate, and are, so to speak, held together by the moving rule with its two scales. For this reason one criticism may be applicable. The normal C.D.C. may be used for a number of queer purposes connected with D/R and it is unlikely that the Goudime can be used in the same manner. As, however, the principle necessarily remains the same, this instrument probably awaits only the attentions of some patient expert who will evolve ways and means of solving course correction, conversion angle, "running fix," and similar problems. Even if this is not possible the fact that it will work double-drift problems is a fair compensation.



In this sketch of the "D"-type Simmonds-Goudime calculator, the double-drift arm has, for the sake of clarity, been swung over to the right. The proportional calculator, shown separately, is mounted on the back of the instrument, behind the central disc, which has a hollow spindle to allow track bearings to be measured.

As a matter of interest, here are given some comparative results in straightforward course and ground-speed problems solved respectively by drawn vector diagrams and by the use of the S.-G. calculator. In each case only the first result with the latter, while working quickly, is used, while the drawn results can be taken as being accurate to within 1 deg. and 1 m.p.h. either way.

Vector Diagram.		Simmonds-Goudime.	
279°	120 m.p.h.	278°	120 m.p.h.
42°	118 ,,	41°	120 ,,
347°	120 ,,	346°	120 ,,
205°	114 ,,	203°	115 ,,
148°	91 ,,	146°	93 ,,

When worked out in uncomfortable surroundings the ground-speed figures for the calculator would probably be seen only to the nearest 5 m.p.h. The differences are certainly not very serious. Over a 200-mile flight the ground-speed divergence in the last (and worst) example would give an E.T.A. difference of less than three minutes on the right side; without course-correction (and supposing that the given wind speed and direction are miraculously correct) the pilot would, in the same example, arrive at a point some six miles to the north-east of his destination.

INDICATOR.

PLASTICS in AIRCRAFT CONSTRUCTION

Some Practical Applications : Further Extracts from Dr. de Bruyne's R.Ae.S. Paper

PART II

WE have seen that the high bearing strength of Aerolite makes possible a considerable saving in weight in components where bearing loads predominate.

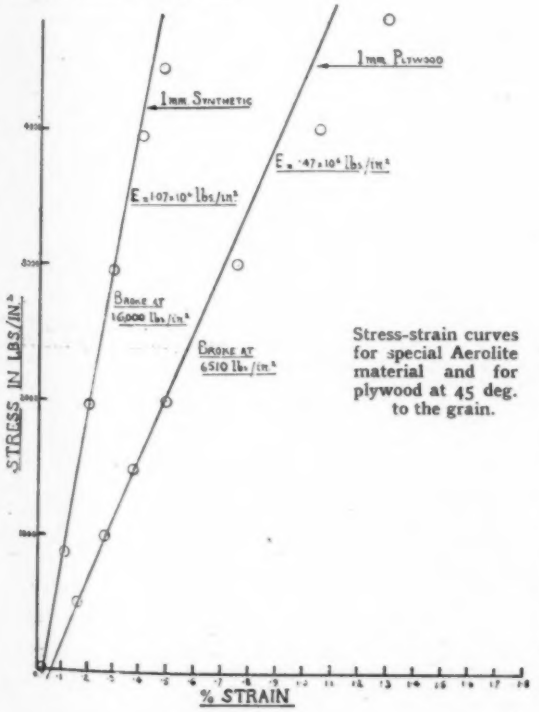
But this is not the only instance where the use of Aerolite can effect a considerable saving in weight. A special type of reinforcement makes it possible to obtain both increased stiffness and increased strength for a given weight (or alternatively reduced weight for an equal stiffness or strength) in torsional and vertical shear in comparison with alclad or plywood as ordinarily used.

Because of the great importance of torsional stiffness in modern aircraft, I believe that this is one of the applications of Aerolite of most immediate interest to designers. As is well known, the critical flutter speed of a wing is in general determined not by the separate magnitudes of flexural and torsional stiffness, but by the ratio of torsional to flexural stiffness and the greater this ratio the higher is the critical speed, provided the centre of gravity lies behind the elastic axis.

The method of making Aerolite to give a high torsional strength and stiffness is to fold and press the fabric in such a way that the warp and weft are parallel to the lines of principal stress.

Plywood can, of course, be made also with the plies at 45 deg. to the edge of the sheet, but the material is expensive and considerable waste is incurred in its production.

In most aircraft structures the ratio of shear load to depth of structure is such that we are concerned only with Wagner beams in which the web is in a state of tension at about 45 deg. to the necessary stiffeners. Thus in comparing the relative merits of plywood and Aerolite the proper bases of comparison for strength and flexibility are the tensile strength and the Young's Modulus respectively measured at 45 deg. to the edge of the sheets. It can be shown that the factor governing the torsional stiffness of a structure made from thin sheet with stiffeners is not G (the rigidity modulus), which ceases to have a meaning in such cases, but $E/4$ where E is the value of Young's Modulus at 45 deg.



Stress-strain curves for special Aerolite material and for plywood at 45 deg. to the grain.

The graph shows comparative stress strain curves for 1 mm. threeply to specification 3V4 made with "Tego" cement, measured at 45 deg. to the grain, and also for the special Aerolite material. It will be seen that the stiffness is increased 2.3 times, the strength 2.5 times, and the weight 1.7 times by the use of Aerolite instead of plywood of the same thickness.

Cowlings of Aerolite.—The primary requisite of cowling is stiffness, the second freedom from liability to fatigue failure. It can easily be shown that for equal weight Aerolite can give the same stiffness as duralumin; the static strength of the Aerolite will, however, be greater, as also will be energy absorption.

COMPARISON OF AEROLITE WITH SOME OTHER MATERIALS FOR COWLING.

Material.	Ratio of weights for same stiffness.	Ratio of strengths for same weight.
Duralumin	1.0	1.26
Aluminium (half hard) ...	1.0	3.6
Electron sheet	1.31	1.17

These results are of greater significance than appears at first sight, because so often the thickness of an aeroplane covering is determined not by the structural loads, but by its strength under handling loads. Thus the covering of a fuselage is often made much thicker than is required by flying and landing loads, because it has to be capable of resisting handling loads applied at right angles to the plane of the sheet.

Aerolite in Structures.—Although the strength of Aerolite in relation to its density can compare favourably with the values for other materials, a comparison on the basis of Young's Modulus divided by density suggests that for equal weights the Aerolite will result in a far less rigid structure. Some representative figures are given below:

Material.	Tensile Strength, tons/sq. in.	Compressive Strength, tons/sq. in.	Density.	E	Tensile Strength/ρ	Compressive Strength/ρ	E/ρ
High tensile steel ...	90.0	—	7.92	30.0	11.4	—	3.8×10^6
Spruce ...	4.5	2.2	0.45	1.5	10.0	4.9	3.3×10^6
Duralumin ...	25.0	25.0	2.85	10.5	8.78	8.78	3.7×10^6
Aerolite cord	11.6	11.2	1.34	2.9	8.66	8.4	1.5×10^6

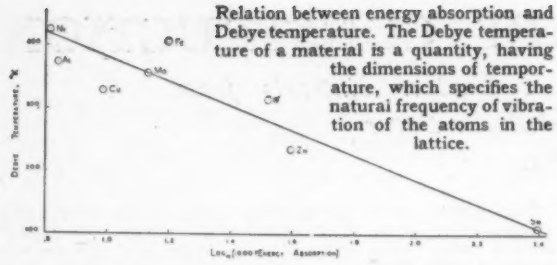
Actually, however, this is not a proper basis of comparison of stiffness or of strength, because both involve not only constants characteristic of the material but also of the geometrical features of the structure. No general basis of comparison is therefore possible, and we must specify in each case the type of structure considered and what quantities are to be regarded as variable. In aircraft, aerodynamic considerations often fix external dimensions and the designer is able to vary internal dimensions only. Thus, in a wing or fuselage the external dimensions can generally be regarded as fixed and the thickness of the covering as variable.

Low Density

Advantages of Low Density.—Generally a low density is more important than a high Young's Modulus (as was, I think, first pointed out by F. R. Shanley). A decrease in density, even though accompanied by a corresponding decrease in Young's Modulus, would therefore be beneficial. With this object in view we have carried out experiments to produce a light resin by giving it a sponge-like structure and we find that the density can be reduced in this way to 0.3 without resulting in too friable a material.

Such a light material should make possible the use of very thick walls so that a pure stressed skin construction should be possible even in fuselages and wings of large diameter.

Aerolite Bearings.—Reinforced Bakelite is used with great success for bearings under conditions of slow speed and great pressure. In rolling mills the use of this material has resulted in considerable economies both in power consumed and, due to the long life of such bearings (about thirteen times that of metal bearings), in replacement expenses. The bearings have the additional advantage of being "non-seizing"; should lubrication fail, the bearing gets hot and produces an intensely strong smell of burning phenol without damaging the shaft. Whereas it is not generally possible to start up under full



Relation between energy absorption and Debye temperature. The Debye temperature of a material is a quantity, having the dimensions of temperature, which specifies the natural frequency of vibration of the atoms in the lattice.

load with metal bearings because seizing troubles due to interruption under static load of the oil film, no such difficulties are found with Aerolite. In addition, dust and dirt do not have the deleterious effect on shafts running in Aerolite bearings that is observed when white metal or bronze is used.

Many fittings in aircraft are subjected to rather similar conditions of slow movement, very often reciprocating in character, and sometimes of considerable pressure, and it may therefore be advantageous to use bushings of Aerolite instead of brass in control levers and the like.

Conversely the elimination of the necessity for metal bushings in Aerolite fittings leads to a saving in weight, and in a control lever we have made (to replace one in metal where trouble had been experienced with corrosion) the saving in weight and cost was quite considerable. In c.p. Aerolite airscrew blades the Aerolite can be made to bear directly on to metal and the conditions of operation (slow reciprocating motion) are just those suited to such a combination.

Research has not yet reached a point where the precise field of utility of such bearings can be defined. Their low heat conductivity (about 1/500 of that of a metal) rules them out for operation in engines, for example, though Bakelite with a graphite filter may be of service under conditions of high speed operation where the bearing loads are light.

Ball and roller bearing cages are quite commonly made of synthetic material. Examples are manufactured by Ellison Insulations, Ltd.

Airscrews.—One of the earliest applications of reinforced Bakelite was the construction in the United States of airscrews from impregnated and pressed cotton duck material. I believe that such airscrews were in use during the war 1914-1918 on "Liberty" engines. L. G. Nilson was granted a patent for such airscrews in 1919.

The development of controllable pitch airscrews of Aerolite is due in the first place to F. W. Caldwell and N. S. Clay, who, in N.A.C.A. Technical Notes Nos. 198 to 201 have given us an account of what may fairly be described as a brilliant engineering achievement.

The stress at any section of an airscrew blade is a combination of tension due to centrifugal pull, and bending due to the aerodynamic thrust; there is also bending in a plane at right angles due to the aerodynamic drag force on the tip portion. Wooden blades, by virtue of their lower inertia forces, are much lighter than fixed metal blades, and the thicker sections give a slighly higher drag at the gain of a slightly better static thrust. With the advent of the controllable pitch propeller, this slight aerodynamic advantage of the wooden blade disappeared; but there remained with the metal c.p. screw very high centrifugal and inertia forces at the blade root which had to be carried under conditions of the utmost reliability in a rotating bearing. A hub so heavy was required that many were of the opinion that at least for small aircraft the extra weight largely counterbalanced the possible increase in disposable load due to improvement in the take-off.

It will be seen that Aerolite makes a very suitable material for controllable pitch airscrew blades. Its low density results in low centrifugal and inertia forces and consequently a light hub can be used. It has good energy absorption and fatigue characteristics, in particular it is free from corrosion fatigue; its notch sensitivity is such that there need be no fear of stress concentrations. For these reasons the de Havilland Aircraft Co., Ltd., in co-operation with Bakelite, Ltd., and Aero Research, Ltd., are developing airscrew blades of this material.

THE DISCUSSION

MR. H. E. WIMPERIS, President of the R.Ae.S. and Director of Scientific Research at the Air Ministry, recalled that in spite of his work at Trinity College, Cambridge, Dr. de Bruyne had found time to carry out very interesting research on synthetic resins with a view to developing them for aircraft construction. Not only so, but he had actually designed a little aeroplane, which he had called "The Snark," had flown it himself, and had made a tour of Europe on it. (See *Flight* of December 27, 1934, and February 14 and 21, 1935.—ED.)

MR. M. LANGLEY, who opened the discussion, referred to the language difficulty. Some of the terms used were confusing to the engineer, and probably some of the aeronautical expressions puzzled the chemist. He personally admitted that he had been floored by the word "Syneresis," and would like to know what it meant. With reference to synthetic resin materials, he would like the lecturer to state if the properties were consistent, as with metals. If one put certain things "into the pot" could one be certain that what came out of the pot was always what one expected. As regards the drop in strength after ten hours of heating, at one particular temperature, was that repeated at other temperatures? Time and temperature were apparently important factors, and as one might meet in the tropics temperatures up to 50 deg. C., although one would not, of course, meet temperatures as high as 100 deg. C., would a lower temperature sustained for a longer period of time cause the same phenomenon? He thought that in connection with reinforced synthetic resins they could probably learn a lot from concrete construction, and asked if other materials had been tried for reinforcement, such as metal mesh. What most aircraft designers would like to see were large moulded components for in large mouldings, he thought, lay the way to cheapness.

MR. W. O. MANNING was interested in the compressive strength parallel to the reinforcing cords. The lecturer had given the strength at right angles to the cords. He recalled that in the early days of flying he (Mr. Manning) had experimented with Bakelite paper for covering the leading edges of wings. Plywood had an unpleasant habit of deteriorating and showing bumps, and he found that the Bakelite paper withstood weathering perfectly. The subject of adhesion was little understood, and he wondered why it was that although glue and cellulose would stick on glass there was difficulty with Bakelite.

Initial Reinforcement

MR. A. R. DUNTON pointed out that Aerolite was not a new material, and that there was a B.E.S.A. specification which covered it. He wondered why cotton was used for reinforcing, and not fine phosphor bronze or steel wire. He showed a slide of a very successful impact-testing machine with two hammers, used by Metropolitan-Vickers; this might be of use for testing aircraft materials. He suggested that a commercial article known as Premix boards might be used for aircraft construction. It could be moulded to any desired curvature by submersing it in hot oil. It might be used for wing covering.

DR. F. W. LANCHESTER complimented the makers of synthetic resins on the progress they must have made. Many years ago he tried this material for gear wheels, but found it "crumbly," like a biscuit. He sent the first lot of material back, but the batch sent to replace it was very little better.

MR. I. J. GERARD, a Senior Technical Officer at the Royal Aircraft Establishment, Farnborough, referring to the lecturer's figures for strength of a flat plate, said that buckling was of little moment; what mattered was the point at which one got complete collapse. For *monocoque* fuselages he thought one could use the method given by Dr. de Bruyne for calculating the strength in compression of a cylinder. He thought the figures given by the lecturer in different sections of the paper did not agree very well, and his own calculations indicated that duralumin was approximately two and a half times as good as Aerolite.

MR. C. D. PHILIPPE, of Bakelite, Ltd., explained that the name Bakelite was used to describe a bonded material, while Aerolite was a reinforced material. He explained that a great deal of work was being done and progress made behind the scenes. On the subject of metal fillers, suggested by some speakers, the problem was to get adhesion between the metal and the resin. If adhesion was not sufficient, one might as well use the wire mesh by itself and omit the resin. In conclusion, he expressed the willingness of the synthetic resin manufacturers to co-operate with the aircraft manufacturers in developing suitable materials.

MR. CONNOLLY, of the British Aircraft Manufacturing Co., Ltd., pointed out that the requirements outlined about a year ago were already being met, and that it seemed quite possible now to make a wing in synthetic resin material. Although a wing could be made without being reinforced by steel bars, he thought there was much to be learnt from ferro-concrete designers. On the subject of glues and cements, he

would like to know whether casein had any effect on resins. He thought it possible that a good propeller glue might work with resins. At any rate, the smooth surface should not be a hindrance as he had found that propeller glue would take a lump out of a sheet of glass.

Among other questions asked were the following: Would a reinforcement with roughened steel bars make adhesion better? Perhaps the heating process would spoil the small projections of the roughening. Were any results available concerning tests with urea formaldehyde as a cement? Major Maclean, of Imperial Chemical Industries, would like to know if experiments had been made with introducing synthetic resins into wood.

DR. DE BRUYNE, in reply, said that syneresis meant contraction of rather a special kind. Metal reinforcement had yet to be investigated, but he would point out that on a strength-weight basis cotton was stronger than metals. The one exception was when the cross-section in question was very small; then metal reinforcement might prove useful. The difficulty with large moulds was due to trouble with warping after the material left the press. Compression strength parallel with the cords was approximately the same as that across the cords. Consistent results *were* obtained with Aerolite. It was difficult to persuade the resins to enter the pores in wood, and, anyway, the increase in strength obtained was only proportional to the increase in weight, so one was not much better off. Urea resins made excellent cements for aerolite, as explained in the printed paper.

Buying a New Car

THE few weeks preceding Easter invariably mark a peak time for the purchase of private cars, new or second hand. Anyone about to take the plunge will find to-morrow's issue of *The Autocar* of exceptional assistance. It is the annual New Motorists' Number, with contents specially designed to assist in the choice of a new car, and to aid in its successful upkeep. A classified Buyers' Guide to all cars on the British market is a special feature.

The World's Smallest Drill?

DESOUTTER BROTHERS have surpassed their previous achievements by producing a pneumatically operated drill, the "Mighty Atom," which is claimed to be the smallest in the world. The weight is only 1¼ lb. and the whole tool can be gripped in one hand, its small size making it very suitable for aircraft work in confined spaces. Drills up to ⅛in. diameter may be used. The motor is of the vane type and uses only 5½ cubic feet of free air per minute. The pipe line is about the diameter of a normal household power cable, and has an automatic coupling which cuts off the air supply when the pipe is disconnected. All rotating parts have roller and ball thrust bearings and are of heat-treated chrome nickel steel.

There are four models of this little tool, of which three can be supplied from stock, while the fourth is only made to special order, and incorporates a double-jointed, close-corner attachment, the angle being from 10 degrees to complete return, that is 180 degrees, according to the customer's requirements. The first three models mentioned differ in the head design only, one having a normal straight Jacob's or Brooke's chuck, while the other two close-corner drills (30 degrees or right angles) are fitted with split chucks.

The body of the drill is rubber covered, and this serves two useful purposes; if it should be dropped, no damage is done, and on the coldest day the exhaust air causes no discomfort to the operator.

Desoutter Bros., Ltd., whose works are at the Hyde, Hendon, London, N.W.9, are exhibiting on Stand Cb. 401 at the B.I.F., Birmingham.

Lowe-Wylde Fund Tops the Thousand

THE Lowe-Wylde Memorial Fund has now reached the £1,000 mark, so that the goal of its sponsors—£1,100—is now in sight. The fund is to provide for the orphan children of the late C. H. Lowe-Wylde, who was killed in an accident to an ultra-light aeroplane of the type which he pioneered.

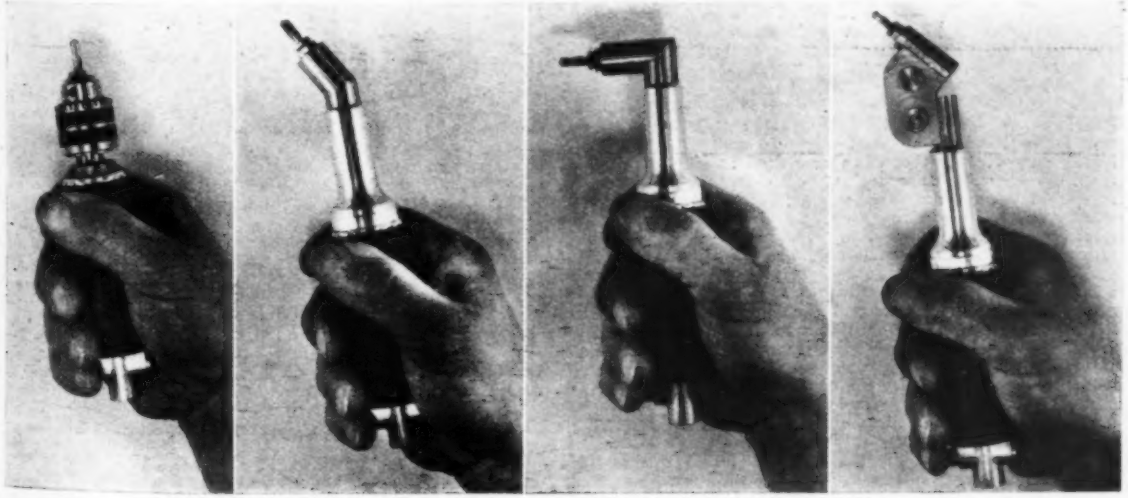
The latest list of donations, up to January 30, is as follows:—

	£	s.	d.
Stanley Spooner ...	5	0	0
P. W. S. Bulman ...	2	2	0
C. W. Meredith ...	2	2	0
A. J. S. Pippard ...	2	2	0
C. J. Turner ...	2	2	0
Henken Widengren ...	2	0	0
Reginald M. Balston ...	1	16	0
R. Roxbee Cox ...	1	10	0
H. M. Buist ...	1	1	0
R. S. Capon ...	1	1	0
J. W. Dunne ...	1	1	0
L. F. R. Fell ...	1	1	0
F. M. Green ...	1	1	0
Professor C. J. Jenkin ...	1	1	0
B. W. Shilson ...	1	1	0
H. M. Cave-Brown-Cave ...	1	0	0
Charles Breese ...		10	6
A. Davenport ...		10	6
G. W. Hart ...		10	6
F. H. Bramwell ...		10	0
T. W. K. Clarke ...		7	6

Cheques, made payable to "The Lowe-Wylde Memorial Fund," should be sent to Mr. E. C. Gordon England, London Air Park, Feltham, Middlesex.

Blackburn Acquire Cirrus

THE Cirrus-Hermes Engineering Co., Ltd., is being acquired by the Blackburn Aircraft, Ltd., which was incorporated as a public company in April, 1936. Correspondence should in future be addressed to Cirrus Engine Department, Blackburn Aircraft, Ltd., Brough, East Yorkshire.



Four versions of the Desoutter air drill described above: (left to right) The standard model with keyed or keyless chuck; The 30 deg. and right-angle close-corner types; and the special double-jointed close-corner drill built to order at any head angle.

STARTLING ENGINE CLAIMS

Revolutionary But Simple Principles in a New Unit Being Developed for Aero Work

WHEN the inventor claims for a new internal-combustion unit that it will run with absolute reliability at speeds varying between idling and 11,000 r.p.m., that it will develop 100 b.h.p. per litre, that it will accept commercial spirit on a 12 : 1 compression ratio, that it consumes only .32lb. per h.p., and that under these conditions it is quite satisfied with ordinary "pot" sparking plugs, one's curiosity is aroused.

Yet such statements have been passing round in Lancashire for some time now. They have been applied to an engine designed by Mr. F. M. Aspin, and a company has been formed to carry on development work, the concern being F. M. Aspin, Ltd., Egyptian Mills, Elton, Bury.

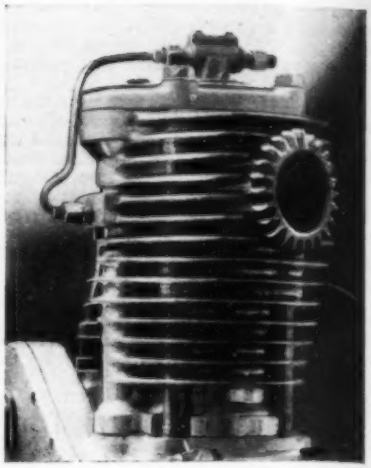
So far the experimental work has been done on motor cycle engines but an aircraft engine is now being made, although as yet it is not permissible to reveal the details of construction.

So far as the motor cycle engine goes a general description may indicate the possibilities. The single-cylinder unit is of alloy construction throughout, with a nitrogen-hardened liner in the barrel. Including the 18lb. flywheels necessitated by the 13 to 1 compression ratio, the weight is only 48lb. and the power developed is over 25 b.h.p. at 11,000 r.p.m., so that a ratio of about 2 lb. per h.p. is obtained and the fuel consumption is 0.32 to 0.35 lb. per h.p., using B.P. Ethyl. Ordinary commercial grade spirit can be used without difficulty.

High Thermal Efficiency

The features upon which the high thermal efficiency are based are the complete scavenging of the exhaust gases and the controlled turbulence of the charge. The high thermal efficiency and the uniform heating of the cylinder interior permit high compression ratios to be used without introducing insuperable cooling problems.

Externally there are no moving parts, all the intake and exhaust controlling mechanism being completely enclosed within the cylinder barrel and head and having no adjustments apart from its own inherent compensations for wear and heat. The mechanism, it is stated, absorbs no greater mechanical power than a magneto, and will last at least as long as the crankshaft bearing, *i.e.*, the life of the engine.



This photograph of the cylinder of the experimental Aspin engine suggests a Diesel conversion at first glance, but gives no hint of the system that is employed in actual fact.

The aero engine, which is now being built, is a compact unit of 1,731 c.c. (83 x 80 mm.) with four cylinders, opposed in pairs, with a three-throw crankshaft. It is to develop 80-100 b.h.p. with the rather startling normal r.p.m. of 5,000, and a maximum of 8,000 r.p.m. The weight, including a 2 · 1 reduction gear, will be approximately 100 lb. so that the weight-power ratio is to be in the region of 0.81 lb./h.p.; this could be improved by increasing the speed if required, as the engine is quite capable of turning at a much higher rate than the 5,000-8,000 r.p.m. range adopted. This, however, would raise the difficulty that the thrust horse-power would be very low at take-off; a 4 : 1 reduction would seem to be nearer the mark.

Elektron crankcase, light alloy barrels and heads, and special alloy connecting rods are being used. The air-cooled cylinders are cast in pairs and are of streamlined form. A single carburetter with a rotary vane type of mixture distributor is to be fitted. The unrestricted inlet port is 1½ sq. in., and the exhaust port 2 sq. in. in area.

Although it is not possible to give details of the internal construction, *Flight* has been permitted to examine the drawings and component parts, and it is possible to say that the design is of that exceedingly simple order that prompts the query, "why did nobody do it that way before?"

LONDON'S AIR DEFENCE

THE chance of defeating an air attack on London is a subject much discussed in these days in all circles, and consequently a large number of members was present at the Royal United Service Institution on Wednesday, February 3, when Brevet Lieut.-Col. K. M. Loch, M.C., of the Royal Artillery, read a paper on "Anti-Aircraft Defence." Air Chief Marsh Sir Hugh Dowding, K.C.B., C.M.G., was in the chair. Speaking to an audience composed mostly of officers, active and retired, of the Navy and Army, the lecturer confined himself to what might be called the A B C of the subject. He said that there were three forms of air attack which the enemy might make (1) on the morale of the population. This would only need random bombing, and its effect would depend on whether the population was or was not trained in methods of protection. (2) On food supplies, which called for more accurate bombing. The remedy was the provision of alternative routes. (3) On military objectives and industries, which, the lecturer said, was not the direct road to victory in giving quick results. The defence, he said, had to decide whether it was defending morale or some other objective. Active defence meant destroying the raiders and employing the counter-offensive, and passive defence meant making it more difficult for the bombing to be effective. This implied dispersion in some cases, and generally training the population in avoiding the results of the bombing.

Active defence consisted of fighter aircraft, guns, searchlights, and A.A. machine guns. As an R.A. officer, the lecturer's remarks on the guns were most interesting. After considering all circumstances, he gave it as his opinion that the guns would take a definite toll of the raiders. They should be on mobile mountings, in order to spring a surprise on the enemy. He said that they had a very good predictor, which would make fire effective if the raiders flew on a straight and level course. They had to do that, he said, when engaged in bombing and when keeping formation.

A.A. machine guns should have a rapid rate of fire, and should discharge a 1½ lb. shell. They were for dealing with low-flying bombers, and should be so disposed as to give an easy shot at dive bombers. As in duck shooting, he said, shots would sometimes be easy and sometimes difficult.

Searchlights needed high skill in the crews. The beams should not wander over the sky in search of raiders, but should shoot straight up at them. He said with emphasis that he believed the Territorials would do well in working the guns and searchlights.

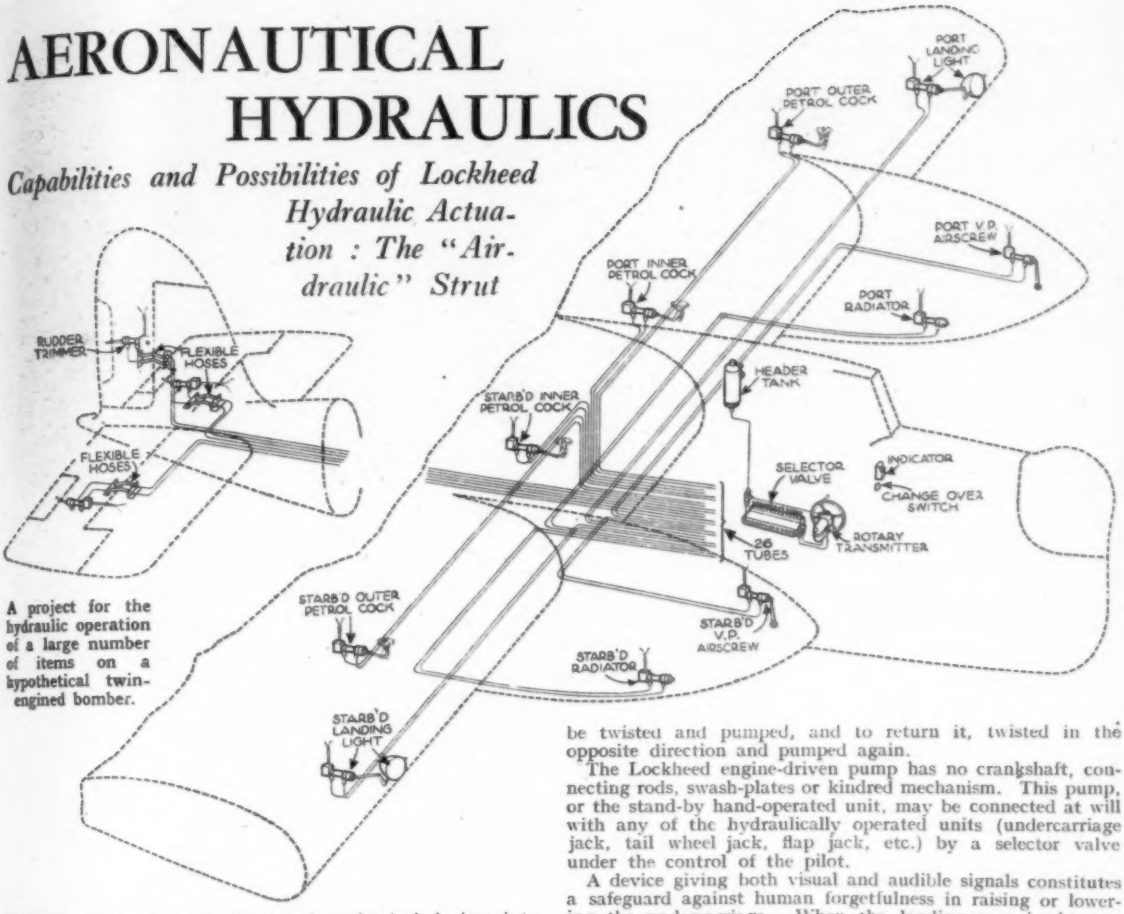
When questioned about concrete bomb shelters, the lecturer asked the chairman to reply. Sir Hugh Dowding said that great thickness of concrete was only necessary against armour-piercing or semi-armour-piercing bombs. These were heavy and expensive, and sacrificed explosive weight to weight of casing. They were only suitable for aiming at special targets, and for general purposes were less effective than ordinary air bombs. Great thicknesses of concrete over shelters, therefore, seemed an extravagant luxury.

Piston-ring Progress

THE foundry of Hepworth and Grandage, Ltd., of Bradford, is being doubled in size as soon as possible in order to deal with the increasing demand for Hepolite products in general. A new bay has lately been added to the single cast ring shops.

AERONAUTICAL HYDRAULICS

Capabilities and Possibilities of Lockheed Hydraulic Actuation : The "Airdraulic" Strut



A project for the hydraulic operation of a large number of items on a hypothetical twin-engined bomber.

THE continued encroachment of mechanical devices into even the remotest portions of large modern aircraft seems inevitable. In smaller machines, too, the "gadget merchant" is leaving his mark. The extra convenience offered by these new contrivances is necessarily accompanied by complication, and it devolves upon the designers of accessory gear to limit that complication as much as is humanly possible without sacrificing dependability or demanding any great physical or mental effort.

The Automotive Products Co., Ltd., of Leamington Spa, Warwickshire, are applying their experience in the manufacture of Lockheed hydraulic brakes to the production of remote controls for aircraft use, and have developed a series of pumps, jacks, indicators, etc., with some interesting features.

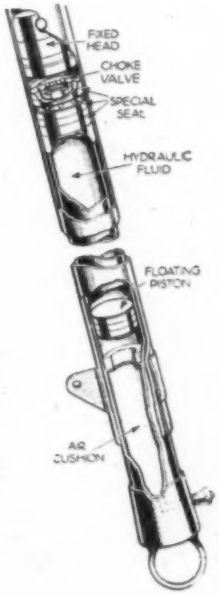
The employment of a simple hydraulic jack in conjunction with a power-driven pump confers simplicity, any desired speed ratio (depending on the proportioning of the hydraulic units) and, through the application of valves, the ability to make the mechanism reversible or irreversible.

It is possible to install the Lockheed undercarriage jacks at any angle and, thanks to flexible connections, to swing them through any arc. One type has a mechanical locking device at the inner extremity of its stroke, while a second provides a lock at each end. The mechanical lock, it is claimed, enables an end load to be carried directly by the structure of the jack, ensuring that any rupturing of the fluid system that may occur as the result of an accident shall not affect the safety of the aircraft. The jacks may be used as part of an electric circuit which is completed by operating units (a hand pump, connection with a hydraulic flap control, or an engine-driven pump), there being appropriate indicating instruments in the pilot's cockpit.

In the Lockheed flap control system the jack or jacks are attached directly to the flap. Where the hinge movement of a flap is sufficiently large as to require considerable effort on the part of the pilot the flap gear can be operated by the Lockheed engine-driven pump. The alternative means of operation is through a hand pump unit, the handle grip of which controls the flap. To lower the flap the handle must be twisted and pumped, and to return it, twisted in the opposite direction and pumped again.

The Lockheed engine-driven pump has no crankshaft, connecting rods, swash-plates or kindred mechanism. This pump, or the stand-by hand-operated unit, may be connected at will with any of the hydraulically operated units (undercarriage jack, tail wheel jack, flap jack, etc.) by a selector valve under the control of the pilot.

A device giving both visual and audible signals constitutes a safeguard against human forgetfulness in raising or lowering the undercarriage. When the landing gear is down a green light is shown, when in course of retraction an orange light appears, and when up a red light in addition to the orange light is flashed. Furthermore, a control box in connection with the A.S.I. ensures that when the air speed drops to approximately that of the machine when about to land a bell will ring should the undercarriage be retracted.



The simplicity of the Lockheed "Airdraulic" leg can be gathered from this sketch.

Apart from gear suitable for the operation of undercarriages, flaps, etc., which require to be moved from one extreme position to another, Lockheeds are offering a range of controls suitable for use with devices calling for adjustment within close limits, e.g., trimming tabs, radiator shutters, cooling flaps, etc. Essentially the system employed consists of a master hydraulic transmitter designed so that according to the direction in which the hand wheel is rotated fluid is pumped in one direction or the other. The slave units used in conjunction with this transmitter are simple piston-cylinder units giving positive actuation in both directions. A special automatic mechanical locking device is incorporated which is freed automatically upon the application of pressure. A selector valve is employed so that the transmitter may be used with a number of slave units. Electrical

connections are made between the appropriate electrical transmitter mounted on each slave unit, and an electrical repeater adjoining the selector valve, so that the position and subsequent movement of the selected slave unit is indicated.

A great deal of research work is being conducted with the view to controlling hydraulically far more items than hitherto. The drawing on p. 155 indicates some possibilities.

Yet another Lockheed "line," already introduced to readers of *Flight*, is the hydraulic ring bolt operating equipment as used on the Blackburn Sharks in the Fleet Air Arm.

Extreme simplicity of design characterises the "Airdraulic" shock absorbers developed for aircraft use. These consist essentially of two telescopic tubes and employ air as the springing medium and hydraulic fluid for energy dissipation. A number of problems, it is claimed, are solved by remotely imprisoning the air, sealing it by a floating piston backed by hydraulic fluid. This device eliminates air glands, prevents the undetected leakage of air and solves the problem of lubricating the air seal. The floating piston is designed with a certain initial friction so that it remains in place at the boundary between air and fluid. The result is that no matter at what angle the strut may be placed, and whether inverted or not, the fluid is held ready for duty. In the unlikely event of a gland leakage fluid and not air would be ejected, making for easy detection. Should there be an escape of air before taking-off, the rough taxying would be immediately noticeable, and, moreover, should all the air be lost during flight, the fluid, held in place by the floating piston, would permit practically a normal landing to be made.

When taxying, the load is supported by a cushion of compressed air which provides a resilient suspension and exerts a force which must be overcome before any shortening of the strut is possible. Movements set up by bumps on the aerodrome are smoothed out by the compressed air, and as they are comparatively slow the fluid is not normally called into play except for damping purposes.

On landing, the air is further compressed and the fluid forced through the valve into the plunger-head with a choke action which dissipates the surplus energy. When the strut closes, fluid is transmitted from the upper to the lower chamber. Rebound movement is controlled at a different rate by the two-way floating choke valve in the main plunger which restricts the return flow of fluid on the extension stroke. Special supplementary mechanical damping is also incorporated. The compressed air returns the strut to normal after it has been closed by a heavy landing, but, it is claimed, undesirable violence is prevented by the damping valve which restricts the return flow of fluid on the extension stroke.

AT THE B.I.F.

A NUMBER of firms well known in the aircraft industry are represented at the Birmingham section of the British Industries Fair, to be held from February 15 to 26. Two makers of complete aeroplanes, General Aircraft, Ltd., and Kronfeld, Ltd., are among the exhibitors. Among firms with products of interest to the aircraft industry are those mentioned below. At the end of the list will be found certain other exhibitors at the Olympia Section in London.

BIRMINGHAM SECTION.

Accles and Pollock, Ltd., Birmingham (D915, 812).
Aerostyle, Ltd., London (B908).
Allen, Edgar, and Co., Ltd., Sheffield (D831, 730).
Anglo-American Oil Co., Ltd., London (D406).

B.E.N. Patents, Ltd., London (B825, 736).
Bakelite, Ltd., London (Cb508).
Black and Decker, Ltd., Slough (Cb023).
British Aluminium Co., Ltd., London (D911, 808).
British Oxygen Co., Ltd., London (D511, 410, D324).
British Thomson-Houston Co., London (Cb607, 504).
British Insulated Cables, Ltd., London (Cb501, 400).

Callenders Cable and Construction Co., Ltd., London (Cb501, 400).
Cellactite and British Uralite, Ltd., London (B823, 734).
Cellon, Ltd., Kingston-on-Thames (B625).
Chloride Electrical Storage Co., Ltd., London (Cb407).
Cirrus-Hermes Eng. Co., Ltd., Brough, Yorks (D921).

Desoutter Bros., Ltd., London (Cb401).

Electricars, Ltd., Birmingham (Cb911, 810).

Firth, Thos., and John Brown, Ltd., Sheffield (D408).
Firth-Vickers Stainless Steels, Ltd., Sheffield (D513, (D727, 412).
Fletcher Miller, Ltd., Dukinfield (D309).
Fox, Saml., and Co., Ltd., Sheffield (D711, D713, 612).

General Aircraft, Ltd., Feltham, Middlesex (D919, 816).
General Electric Co., Ltd., London (Cb617, 514).

Henley's, W. T., London (Cb501, 400).

I.C.I. Metals, Ltd., London (D503, 402).
Imperial Chemical Industries, Ltd., London (D405).
Incandescent Heat Co., Ltd., Birmingham (D327, 226).

Kronfeld, Ltd., Feltham, Middlesex (D818).

London Aluminium Co., Ltd., Birmingham (A511, 408).
London and Midland Steel Scaffolding Co., Ltd., Old Hill, Staffs. (D526).

Metropolitan-Vickers Electrical Co., Ltd., Manchester (Cb806).
Moseley, D., and Co., Ltd., Manchester (D719).

National Benzole Co., Ltd., London (D814).

Philips Lamps, Ltd., London (Cb912).
Pinchin, Johnson and Co., Ltd., London (B515, 414).
Pitman, Sir Isaac, and Sons, Ltd., London (B901).
Priestman, T. J., Ltd., Birmingham (D607).

Reynolds Tube Co., Ltd., Birmingham (D725, 624).
Rotax, Ltd., Birmingham (Cb601).
Rubery, Owen, and Co., Ltd., Darlaston (D903, 802).

Silvertown Lubricants, Ltd., London (D307).
Simmonds Aerocessories, Ltd., London (D222).
Salter, Geo., and Co., Ltd., West Bromwich (A507, 404).
Standard Telephones and Cables, Ltd., London (Cb501, 400).

Tecalemit, Ltd., Brentford, Middlesex (D515, 414).
Terry, Herbert, and Sons, Ltd., Redditch (B520).
Turners Asbestos Cement Co., Manchester (Ca401).

Vacuum Oil Co., Ltd., London (D427).
Venesta, Ltd., London (B811, 722).

Wakefield, C. C., and Co., Ltd., London (D507).
Wellworthy Piston Rings, Ltd., Birmingham (D328).
Wild-Barfield Electric Furnaces, Ltd., London (Cb403, 302).

Zinc Alloy Rust-Proofing Co., Ltd., Wolverhampton (B914).

OLYMPIA.

Aerofilms, Ltd., London (C439 A).
Bakelite, Ltd., London (F703).
Ebonestos Insulators, Ltd., London (F709).
Insulators, Ltd., London (F845).
Johnson, Matthey and Co., Ltd., London (D565).
Mouldrite, Ltd., London (F705).
Rozalex, Ltd., Manchester (H1041).

PUBLICATIONS RECEIVED

Our Wings Grow Faster, by Grover Loening. Doubleday, Doran and Co. 91 Gt. Russell Street, London, W.C.1.

National Advisory Committee for Aeronautics. Report No. 558: Turbulence Factors of N.A.C.A. Wind Tunnels as Determined by Sphere Tests, by R. C. Platt; price 10 cents. No. 559: The Forces and Moments Acting on Parts of the XN2Y-1 Airplane during Spins, by N. F. Scudder; 5 cents. No. 560: A Simplified Application of the Method of Operators to the Calculation of Disturbed Motions of an Airplane, by R. T. Jones; 10 cents. No. 563: Calculated and Measured Pressure Distributions over the Midspan Section of the N.A.C.A. 4412 Airfoil, by R. M. Pinkerton; 10 cents. No. 564: Tests of a Wing-Nacelle-Propeller Combination at Several Pitch Settings up to 42°, by R. Windler; 10 cents. No. 565: Measurements of Fuel Distribution within Sprays for Fuel-Injection Engines, by D. W. Lee; 10 cents. No. 566: Ground-Handling Forces on a 1/40-Scale Model of the U.S. Airship "Akron," by A. Silverstein and B. G. Gulick; 10 cents. No. 569: Wing-Nacelle-Propeller Interference for Wings of Various Spans Force and Pressure-Distribution Tests, by R. G. Robinson and W. H. Herrnstein; 10 cents. No. 576: Aircraft Accidents—Method of Analysis; 10 cents. Superintendent of Documents, Washington, D.C., U.S.A.

The Magazine of the Electrical and Wireless School, Royal Air Force, Cranwell. No. 3. December, 1936. Cranwell, Lincolnshire.

The Hawk (Journal of the Royal Air Force Staff College). Dec., 1936. Price 3s.

No. 603 City of Edinburgh (Bomber) Squadron. 1936. Auxiliary Air Force, Turnhouse, Edinburgh 12.

Royal Air Force Quarterly. January, 1937. Price 5s. Gale and Polden, Ltd., 2, Amen Corner, London, E.C.4.

Handbuch der Luftfahrt. Jahrgang, 1936. Published with the support of the German Air Ministry. By Jng. R. Schuiz, Oberlt. a. D. Feuchter und Dr. Jng. W. von Langsdorff. Price 6 Mk. J. F. Lehmanns Verlag, Munchen, Germany.

Measurement of Upper Winds by Means of Pilot Balloons. Published by the Authority of the Meteorological Committee. Price 1s. H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

Your Wings, by Assen Jordanoff. Price $2.50. Funk and Wagnalls Co., New York.

My Flying Life, "an authentic biography prepared under the personal supervision of and from the diaries and papers of the late Sir Charles Kingsford Smith." Price 10s. Andrew Melrose, Ltd., Paternoster House, London, E.C.4.

The City and Port of Hull, 1937. Issued by the City of Hull Development Committee, Guildhall, Hull.

Meteorological Office. Normals of Percentage Frequencies of Surface and Upper Winds over Malta, Egypt, Palestine, Trans-Jordan and Iraq. Price 2s. H.M. Stationery Office, Adastral House, Kingsway, London, W.C.2.

Air Strategy, by Lt.-Gen. N. N. Golovine. Price 7s. 6d. Gale and Polden, Ltd., Wellington Works, Aldershot.

AERONAUTICAL PATENT SPECIFICATIONS.

(The numbers in brackets are those under which the Specifications will be printed and abridged, etc.)

(Published January 28, 1937.)

18248. HORST, H. VAN DER.: Method of and means for preventing the formation of ice on aircraft (458,862).
19068. BAYNES, L. E.: Aircraft having detachable cantilever wings (458,988).
36055. BLACKBURN AEROPLANE AND MOTOR CO. LTD., and CRAWSHAW, A. H.: Flying controls for aircraft (458,887)
10520. LAURET, M. A.: Carburetter for aviation engines (458,980).
15781. KRAFFT, E. and WEICHARDT, R., (Trading as KRAFFT AND WEICHARDT): Aircraft landing sails (458,905).

(Published February 4, 1937.)

27988. BENDIX AVIATION CORPORATION.: Shock struts for aircraft (459,582).

(Published, February 11, 1937.

19870. MAYROW, J. J.; Construction of aircraft bodies wings and aerofoils (459,793).
20161. BENDIX AVIATION CORPORATION: Brakes (459861).
20574. CAIRNS, A.: Aeroplanes (459,895).
23903. BLAKER, H.: Manner of and means for controlling an aeroplane, glider, or the like flying machine (459,730).
11492. BAYNES, L. E., and ABBOTT, LTD., E. D.: Aircraft having single-spar wings of variable incidence (459,691).
13170. DE ROUGE, C.R.A.M.: Aeroplanes (459,639).